DOCUMENT RESUME

ED 272 576 TM 860 492

AUTHOR	Hall, George; And Others
TITLE	Alternatives for a National Data System on Elementary and Secondary Education.
SPONS AGENCY	National Center for Education Statistics (ED), Washington, DC.
PUB DATE	20 Dec 85
NOTE	107p.; For the Invited Papers, and a synthesis of the papers, see TM 860 450 and TM 860 491.
PUB TYPE	Viewpoints (120)
EDRS PRICE	MF01/PC05 Plus Postage.
DESCRIPTORS	Agency Cooperation; Cost Effectiveness; *Data Analysis; *Data Collection; *Educational Quality; Elementary Secondary Education; *Information Dissemination; *Information Needs; Models; National Programs; Outcomes of Education
IDENTIFIERS	*National Center for Education Statistics; Nation at Risk (A)

ABSTRACT

This paper proposes a fundamentally new national data system for elementary and secondary education, differing in structure and content from present education data-collection activities of the federal government, the states, and local education agencies. This report was contracted by the U.S. Department of Education's Center for Statistics as a "10-year plan" of data collection to satisfy the statements made by writers submitting papers to the Center's Redesign Project and appearing in the "Synthesis of Invited Papers," and is intended as a companion to that volume. The current data system is flawed in fundamental ways; it does not provide the kinds of information needed to understand the context, processes, and outcomes of schooling in the United States. These kinds of information are now being demanded by policy-makers as well as by the general citizenry. The proposed national data system is designed to provide essential information for policy-makers in all branches and at various levels of government as well as new constituencies. The structure of the proposed national data system, as well as specific categories and subcategories of data have been identified in the report, and the types of costs and distribution of costs likely to be incurred in developing and maintaining the proposed national data system are enumerated. (JAZ)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED272576

ALTERNATIVES FOR A NATIONAL DATA SYSTEM ON ELEMENTARY AND SECONDARY EDUCATION

GEORGE HALL
RICHARD M. JAEGER
C. PHILIP KEARNEY
DAVID E. WILEY

A report prepared for:

The Office of Educational Research and Improvement

U.S. Department of Education

December 20, 1985

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality

---

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

TM 860 492

TABLE OF CONTENTS

		Page
Preface		1
Summary		5
Part I.	Context, Needs, and Rationale	16
Ch 1.	**Changes in education and new demands for information**	16
A.	Rising public concerns about educational quality	16
B.	The changing nature of educational decision making	19
C.	The catalytic role of A Nation at Risk	21
D.	New users of educational information	23
Ch 2.	**Capabilities of present education data systems**	27
A.	The structure and content of the nation's education data systems	27
B.	The ability of current NCES data projects to meet new demands for education	30
Ch 3.	**What should be the federal role in building a national educational information system?**	39
A.	The mission of the National Center for Education Statistics	39
B.	Assumptions concerning federal participation in a national educational information system	40
C.	An expanded mission for the National Center for Education Statistics	43
Ch 4.	**Designing a new national educational information system**	45
A.	A conceptual framework for describing an educational system	46
B.	Needs and issues addressed by an integrated information system: Some examples	52
C.	Some benefits of a new national educational information system	54

Part II. The Design and Implementation of a New National Data System 56

Ch 5. **Alternative designs for a national educational information system** 57

- A. Introduction 57
- B. The use of educational information 62
- C. The national data base 68
- D. Access to and use of the data base 72
- E. Data collection alternatives 75
- F. Relative costs and benefits of alternative designs 83
- G. Development and phasing of the data system 90

References 99

Preface

We propose a fundamentally new national data system for elementary and secondary education. Our proposal differs in structure and content from present education data-collection activities of the federal government, the states, and local education agencies. Only a fundamentally new system can produce essential data for the nation and the states that are correct, accurate, precise, timely, comparable, and useful. Our proposal may appear costly, demanding, and complex, and will require a long-term commitment from the federal government and the states, but we believe there is no alternative. We have reached this conclusion following an intensive and careful review of recent changes in education, consequent new demands for information, the capabilities of present education data systems, the appropriate federal role in a national data system, and the fundamental characteristics of a responsive data system.

Our proposal is fundamentally different because:

1. the content of the data system is derived systematically; it is based on a clear conception of what education is, and how education operates in the United States;
2. the structure of the data system provides linked data elements, data files, and data records; data are collected about and maintained for individual students, teachers, schools, and school systems;
3. data provided by the system will enable principal policy-makers and other information users to understand the context, processes and outcomes of schooling in the United States;

Further our proposed data system is characterized by:

1. state representative samples of public and non-public schools for all states;
2. a necessarily high level of state and federal cooperation;
3. a coordinated set of federal and state collection efforts;
4. a data base which will provide new data to policy makers at all levels of government as well as data for education research.

The proposed program will provide all data presently collected through all current NCES projects concerned with data on elementary and secondary education. This includes the longitudinal survey program, the National Assessment of Educational Progress, the Common Core of Data, the Vocational Educational Data System, and the several discrete sample surveys of teachers, private schools, etc.

Our report was contracted by the U.S. Department of Education's Center for Statistics as a "ten-year plan" of data collection to satisfy the statements made by writers submitting papers to the Center's Redesign Project and appearing in the Synthesis of Invited Papers. It should be considered a companion volume to the Synthesis of Invited Papers.

Some Questions and Answers About the Report. An earlier draft of our proposal was circulated to key education policy-makers outside and within the federal government. They responded with a set of pertinent and provocative questions that demand thoughtful consideration. Many of these questions are answered in various sections of our report. A synopsis of these questions, and a guide to report sections that provide answers follows:

Q. Why should the Department of Education want to install a totally new national data-collection system, instead of fixing up the one that exists?

A. The answer is twofold: First, the current data system is flawed in fundamental ways; it does not produce traditional statistics that are useful, accurate, comparable, and timely, according to the authors of many of the papers that underlie the Synthesis Report (see Part I, Chapter 2). Second, the current data system does not, and cannot, provide the kinds of information needed to understand the context, processes, and outcomes of schooling in the United States. These kinds of information are now being demanded by policy-makers at all levels of government as well as by the general citizenry. (see Part I, Chapter 1).

Q: How do you know that the system you are proposing will really work?

A: To a modest extent, linked data records for students, teachers, and schools have been used in the past in such Center for Statistics projects as the national longitudinal studies and NAEP. The proposed national data system will capitalize on the experience gained in such projects. In addition, for those elements of the proposed system that are novel, design, development, and implementation procedures include 1) a program of intensive research and development of novel system components, and 2) a period of testing and verification of all newly-developed system components prior to their operational use (see Part II, Chapter 5, Section G).

Q: Isn't there a whole lot of data burden involved from introducing a system additional to the existing state management information systems?

A: Data burden should be considered from the perspective of state education agencies and local education agencies. For a state education agency, the degree of added data burden will depend upon the state's decision either to continue its current data systems, separate from the federal system, or to integrate its data systems with the national system. In the former case, there will be little added data burden for the state agency. In the latter case, the state would likely have to modify its present data systems (and might thereby incur substantial development costs); however, it is not clear that the state would have to provide any more data to the Federal Center for Statistics than are presently required. The added burden imposed on local education agencies would also depend on a state's decision to integrate its data systems with the national system. If a state education agency maintained its data systems, separate from the federal system, only the sampled local agencies within that state would be required to provide data to the federal system. Added data burden for those sampled LEA's might be substantial. If a state education agency integrated its data systems with the national system, all local agencies within the state might be required to provide additional data for the state's system, and possibly for the national system. The magnitude of added data burden for local education agencies would depend on the content of the data systems operated by their states, as well as the content of the federal component of the national data system (see Part II, Chapter 5, Section G).

Q: Aren't you really talking about a lot of data for researchers instead of statisticians?

A: No. The proposed national data system is designed to provide essential information for policy-makers in all branches and at various levels of government as well as the new constituencies identified in our report (see Part I, Chapters 1 and 4; Part II, Chapter 5, Section B). It might also be the case that data collected for essential policy purposes will be of interest to a wide variety of educational researchers, but serving their needs is not the principal function of the proposed data system, nor has the system been designed to serve maximally the interests of the research community.

Q: What would it cost to develop and implement the kind of data-collection system you are describing?

A. The types of costs and distribution of costs likely to be incurred in developing and maintaining the proposed national data system are enumerated in our report (see Part II, Chapter 5, Section F). However, we recommend that carefully-derived estimates of the costs of developing and maintaining the proposed national data system be secured from professional survey research agencies in the public and private sectors.

Q: How long would it take to get data from the kind of system you are describing?

A: The proposed system would provide some data during its first six-month phase and provide data reproducing currently available tables shortly thereafter (see Part II, Chapter 5, Section G). However, we anticipate that the proposed system would not be fully operational with respect to newly proposed data claims before July, 1991. We recognize that the Federal Center for Statistics must meet its ongoing Congressionally-mandated responsibilities to produce information on the status and condition of education in the United States (see Part I, Chapter 3). While the new national data system is under development, all of these responsibilities would be met through a combination of information provided by the new system and appropriate current projects of the

Federal Center for Statistics (see Part II, Chapter 5, Section G).

Q: Why didn't you identify the data items to be included in the system?

A: The structure of the proposed national data system, as well as specific categories and subcategories of data have been identified in our report (see Part I, Chapter 4; Part II, Chapter 5, Section D). Specific data items must be jointly identified by the Center for Statistics and representatives of the constituencies the system is designed to serve, if the system is to effectively meet the needs of these data users. We have proposed a strategy for securing, on a collaborative basis, the judgments of groups of information users on the data elements that would best meet their needs (see Part II, Chapter 5, Section G).

Summary

The most important fact about elementary and secondary schooling in the United States today is that there is almost universal dissatisfaction with its quality. This dissatisfaction, in turn, has begun to force major changes in the educational system; and these changes are taking place within new contexts for making educational decisions. No longer do these decisions fall within the exclusive purview of local school boards and local school administrators. Parents are exploring new alternatives for the education of their children. In the ongoing educational reform, state officials and public bodies are expanding the range of their actions in attempts to improve the quality of schooling. And information about the quality of education--about the quality of schools, school districts, and state educational systems--has become a priority concern for the increasing array of new policy actors now involved in making decisions that affect the quality of the education being received by the Nation's children and youth.

In the past, the primary information users were the education professionals responsible for conducting the educational process. These decision makers participated in local information systems focused around day-to-day decisions made by teachers and administrators. Such information systems generally were limited to providing basic data on the local level about pupils, personnel, educational services, and finances. Now, however, we are finding that information must be conveyed beyond the boundaries of the local educational agency. Parents need information about the character and quality of the the educational alternatives available to their children. The citizenry--local, state, and national--requires and is demanding information about the quality of its schools. The business community--at local, state, and national levels--is calling for systems that will provide quality assurance information on the schools. State officials--governors, legislators, state school board members, officers of state education agencies--require more comprehensive and accurate information on the quality of the schooling being conducted within their purview. Federal officials--from the President through the Congress to the agency adminstrators--are seeking information on the general condition of American education, as well as on the effectiveness of federal education policies and programs.

Fortunately, in our view, the U.S. Education Department and The Office of Educational Research and Improvement view the current climate of reform as an opportunity "to seize the day," to develop the new data acquisition programs that will provide the public the information that it needs and wants, the policy makers the information they need to judge the efficacy of the reform efforts, and the educational community the information it needs to monitor these efforts over time. In our view, the Elementary/Secondary Education Redesign Project comes at a most opportune time, a time when our long-standing faith in the American public school system is being seriously challenged, a time when serious- minded reformers are proposing substantive changes in traditional modes of school operation, a time when the education community has begun to fashion exciting and promising responses to these calls for reform, and a time when an entirely new configuration of education information and data needs is presenting itself.

The Mission of the Center for Statistics

A unified and coherent program for acquiring, analyzing and disseminating information on the condition of education throughout the United States cannot exist without a centralized administrative unit within the federal government that has, as its sole mission, accomplishment of those goals. On March 1, 1867, the Congress acknowledged the need for an agency in the Executive Branch that would meet the nation's needs for information on education. From its very beginning, the central purpose and focus of the Department of Education was the collection, analysis, and reporting of information on the condition and progress of education, for the dual purposes of helping states and local school systems improve their effectiveness and informing the Congress on the general status of and returns to the federal investment in education. The role of The Center for Statistics in fulfilling this mission must now be judged against existing and new data needs. For example, many authors of papers for the NCES Redesign Project cited inadequacies in the scope and coverage of data presently collected, and the inability of the present NCES projects to provide information that can be used to compare the condition and progress of education in the various states.

With the exception of the Common Core of Data, most of the data-collection activities of The Center for Statistics support estimates of parameters only for nationwide, or occasionally for regional, populations. Yet education is an activity that is constitutionally reserved to the states, and, as noted by many of the contributors to the NCES Redesign Project, the vast majority of important education policies originate at the state level of government. The need for education statistics that support comparisons across states has been strongly voiced.

Many contributors to the Redesign Project view the 1974 statement of the Center's mission (defined in the General Education Provisions Act, as cited above) as inadequate to the need for such a center, and, as a step backward from the original charter of the Department of Education. Although the 1974 mission statement defines a specific set of responsibilites for The Center for Statistics, it does not empower a unitary federal agency with sole authority and responsibility for informing the nation on that sector of society labeled "education." As a result, NCES does not do enough and other agencies of the federal government, both within and outside the Department of Education, do too much in their quest for data on schooling and education in the United States.

Unncessary duplication, lack of coordination, and excessive respondent burden are well documented in the papers prepared for the Redesign Project.

The mission we would propose for the Center would make it the federal agency with authority and responsibility for collection of data concerning education in the United States. Other agencies with specific needs for regulatory data on education (such as the Office for Civil Rights, other agencies within the Department of Education, the Department of Labor, the Department of Agriculture and the Department of Defense) might collect such data, provided their activities were coordinated by the Center, and only in situations where it has been unable to meet their programmatic needs for such data.

Our position on an appropriate mission for The Center for Statistics is consistent in spirit with that advanced by the Council of Chief State School Officers (1985):

> "We strongly urge that the function [of NCES] be a true statistical center that assumes the major responsibility for coordination of the collection, assembly, analysis and dissemination for that sector of society under its purview, namely education.

At the core of new requirements is the need for an integrated program of data collection, analysis, and reporting, in contrast to the largely unarticulated set of data collection projects that presently operates at all levels of the education enterprise. Although major factors that influence the operation of the nation's education systems are inextricably linked; e.g., changes in levels of educational resources produce changes in the availability and quality of education personnel, and these, in turn, produce changes in educational offerings and services. Present data-collection projects are inadequate to describe and characterize such linkages. In many cases, the structure and articulation of interrelationships among components of the nation's education systems must be deduced from unexamined inferences or from incomplete and inappropriate empirical findings. No education data system or program adequately characterizes the whole of the education enterprise. Although relationships between educational resources, expenditures for personnel, and the quality of personnel are known in part, there is no integrated educational data system to document the extensiveness and operation of such relationships, either for the nation as a whole or for individual states.

Criteria for a New Educational Information System

In designing a new data system, one needs to answer several critical questions. These include:

1. What information should be collected?

This question addresses not only the "contents" of individual information elements, but also their form, i.e., fundamental linkages between elements that allow or prohibit their use for specific purposes.

2. How should the information be collected?
This issue encompasses not only the methods of data collection, but also the categories of persons and administrative records which will provide the data. Sample design, timing of collection, and provision of standards of data quality--including mechanisms for assessment and control--are also key issues.

3. How should it be made available for use?
This latter question breaks down to: Who should receive what information, in what form when, and at what cost?

These issues address data transmission processes among those reponsible for collecting the data and maintaining the system as well as information flows linking external users into the system. As such they include specification of records to be transmitted, timing and frequency of transmission, aggregations and analyses to be performed and reported, regulation of access--including timing of data releases, provision of privacy and security constraints, availabiity of micro-versus aggregate records, the costs of access and who should bear them.

An educational system is an organization which converts resources into educational services for pupils. From our perspective, one can specify public education as a system at the level of class, school, district, or state. These form a nested set of educational systems, with varying and changing responsibilities for governance and policy formation. Private educational systems typically have fewer organizational levels.

Ultimately, the success of an educational system--regardless of organizational level--is predicated on its outcomes. As a society, we intend the system to help prepare individuals for work, for political participation, and for family life. To the extent that education does not play its role in preparing students effectively, we desire to improve it. Because of the central role of outcomes in evaluating the success of our educational systems, greatly increased efforts have been made recently to improve amount and character of information about pupils' achievements. The intent of these changes--at local, state, and national levels--has been to assess the quality of our educational system and to bring about improvements in them.

A Conceptual Model

In order to apprehend educative processes, we must rely upon a conceptual model. This model may be simple or complex and it may be implicit or explicit, but its existence is a prerequisite to any understanding of the effectiveness and quality of schooling. Our conceptual framework--presented below--for describing an educational system focuses on the school because it is at the level of the school that educational activities take place and that pupils participate in them.

Fundamentally, schools and the communities they serve differ in several important ways:

Family and Community Environment. The families and communities served by different schools differ in significant ways. They differ in the resources available in the homes of the pupils for support of their schooling and they differ in types and levels of aspirations parents have for their children. The family composition of the community affects the attitudes, values, and goals of a pupil's peers. All of these form the context within which schools can educate their pupils.

Educative Difficulty. Schools are faced with differences in levels and types of educative difficulties with which their pupils present them. Some present handicaps or limited proficiencies in English. Others come with limited levels of prior learning. Thus, pupils who enroll in some schools enter with cognitive accomplishments and capabilities, motivations, and out-of-school environments and resources which make educative efforts easier and less complex than those in other schools.

Resources. Schools have available to them different levels of monetary resources and different amounts and kinds of non-monetary resources, such as volunteer time, donated supplies and equipment.

These resources are exchanged, allocated, and configured as a teaching staff, facilities, educational materials.

Goals. Schools aspire to distinctive goals. For example, some public secondary schools design their entire curriculum around post-secondary career paths which primarily begin in selective colleges and universities, while other schools, e.g., "vocational" ones, may focus their whole program around immediate job entry to skilled and semi-skilled occupations.

Process. Schools offer educative experiences for which they require or encourage pupils' participation. These include work experience, homework, and extra-curricular activities as well as in-class experiences. Schools also structure these experiences with different standards. These standards influence the pursuit of goals with different expectations for performance, differing time allowances for accomplishment, and differing criteria for selection into subsequent experiences.

Schools also differ in the types and amounts of participation of their pupils in these educative experiences as well as in the range of experiences made available. These variations include differences in selection, participation, and completion of educational programs, course work, and homework as well as differential school attendance.

Outcomes. All through the schooling process, to the conclusion of secondary schooling and beyond, schools differ greatly in the goal-relevant accomplishments and achievement of their pupils. These include cognitive capabilities, credentials, and career and life paths generally.

Figure 1 in Chapter 4 displays such a conceptual framework. It focuses on the schooling process, distinguishing teaching activities from pupils' exposure and participation in the resulting educative activities. And it traces these aspects of the process to their origins: prior and contemporaneous characteristics of pupils, community and family expectations, curricular goals, and resources, as well as linking them to their consequences.

The consumers of information about educational systems include parents concerned about the education of their children, citizens worried about the quality and efficiency of the education their tax dollars finance, professional educators making decisions about programs and pupils, and public officials desiring to design laws, requirements, and resource allocations which will effectively improve education. All of these consumers are concerned that the information which reaches them be relevant and useful to their needs, be timely, and be accurate.

Common to them all are concerns about quality and effectivenss. It is this information which is most desired in the public debate over education. Parents want to know about the quality of education their children receive and about the qualities of the educational alternatives available to them. Citizens and public officials wish valid assessments of efficiency to know that resource allocations are wisely made and carried through desired outcomes.

Resource flows are important information for public officials in making determinations of how much and how to allocate resources. Federal officials have special concern for how federal resources are channeled to pupils and the impact of these resources on pupils with specific characteristics. State officials, in fulfilling their responsibilities, have been modifying state educational systems in ways that require comprehensive information about participation in programs, courses, and other services, standards of performance and actual outcomes. Local officials are newly concerned that they are effectively monitoring service delivery, participation and achievement.

An effectively integrated system--incorporating the microdata and records necessary to produce these new types of information--is needed by all concerned parties. The benefits of a cohesive system of this type producing national and state comparable data would be far reaching. Not only would the majority of consumers of educational information be provided with relevant, integrated, timely, and accurate information at these two levels, but the establishment of such a system would produce similar changes in district-level information systems. This, in turn, would increase the comprehensiveness and comparability of the information about education taking place in local communities. Thus, the national information system, as it is established at state and national levels will introduce cohesion in the total system.

What is a National Educational Information System?

We have discussed at length the need for an integrated national educational information system built around a comprehensive conceptual model of the schooling process. In the development of such a system, three questions need to be addressed. What sort of data base is called for ? What processes will be used to get information into the data base? What processes will be used to get information out of the data base? We offer general answers to these three questions and, thereby, describe in broad terms our view of what a National Educational Information System must be.

The Data Base. In order to meet the information needs of the broad array of local, state, and national educational decision makers identified in previous chapters, the data base must be structured to provide information on all aspects of the schooling process as described in our conceptual model. This means that the data base must be comprehensive; put simply, it must be adequate in scope and coverage; it must contain accurate, appropriate, and timely information on (1) the school setting, (2) the schooling process itself, and (3) the outcomes of schooling.

Data on the school setting must include information on the environmental factors that impinge on the school, such as community and family characteristics and expectations. School setting data also must provide information on financial revenues as well as other incoming non-monetary resources available to the school. The data base also must include information on the educative difficulties which face the school, such as pupils' capabilities, motivations, handicaps, English language facility, and out-of-school supports.

Data on the schooling process must include a broad range of information. The data base must provide information on the educative goals of the school, its objectives, and curriculum. It must provide information on allocated resources--facilities, staff, equipment, materials, and other non-monetary resources made available for school use. It must provide information on educational pursuits, that is, curricular offerings, standards, teaching-and school-related activities. Equally important, the data base must provide information on the extent of pupil and parent participation in the process of schooling.

Finally, the data base for a national eductional information system must include information on the outcomes of schooling, including pupil achievement data as well as information on such outcomes as high school graduation, drop-outs, political participation, employment, and post-secondary matriculation.

A second major requirement of the data base, in addition to being comprehensive, is that it be integrated, that is, that its data elements, files, and records be linked to one another. The user must be able to ask and have answered questions about the relationship among background characteristics, the schooling process itself, and the outcomes of the process. The data base must be able to provide information to answer such questions as, "What dollars buy what services for which students with what results?" Or, "What programs staffed by what types of teachers are effective for pupils with particular educative difficulties, at what costs?" Only if the data base is so structured as to allow relevant linkages among it elements, files, and records, will the requirement for an integrated educational information system be met.

Getting Information into the Data Base. The dual requirements for a comprehensive and an integrated system demand, in turn, that data be collected in micro record form, as opposed to macrorecord or aggregated form. We define a micro record as a data set concerning an individual entity rather than a data set on a collection or aggregate of individual entities. A micro record can be dealt with as an individual datum or aggregated; for example, individual micro records on pupils can be aggregated to the school level. A macro record on the other hand, generally cannot be disaggregated. More importantly, the micro record permits of linkages with other micro records; for example, micro records on individual pupils can be linked with micro records on individual teachers and, in turn, with micro records on specific curricular offerings in which the teachers and pupils are participating. The micro record format, through its linkage capability, permits the information user to ask questions about relationships among the sets that make up the data base. Thus, a major requirement in designing a process for getting information into the data base we have described above is that the information be collected and stored in micro record format.

Getting Information Out of the Data Base. We have identified the major requirements that must be met in establishing the data base and for getting information into the data base. A third question remains, namely, what processes will be used for getting information out of the data base?

First, a National Educational Information System must be able to deliver information of a comprehensive and integrated nature on the schooling process in the Nation as a whole, that is, it must be capable of delivering information that is nationally representative. It must be able to report on the status and progress of elementary and secondary schooling in the United States. It also must be able to deliver information on sub-national or regional systems and populations. In addition, we have taken as a given that the system must be capable of producing information that can be used to compare the condition and progress of education in the various states; in short, the system must be capable of delivering information that is representative of each of the fifty states.

While such requirements dictate attention to how information gets into the data base, e.g., the sampling designs which will be employed, they also dictate--along with the previously identified requirements of comprehensivenss, integration, and micro record formats--what types of reports must be available to users of the system. Users, with the possible exception of researchers, generally will not be interested in micro records per se but rather reports developed from the processing--e.g., tabulation, aggregation, and analyses--of micro records . Thus, while micro records represent the form in which information flows into the data base, reports based on processing of the micro records represent the form in which information flows out of the data base. Yet, a simple proliferation of reports will not meet the needs of the broad array of local, state, and national decision makers which we have identified in previous chapters. A national educational information system must be capable of carefully tailoring its reporting formats and mechanisms if it is to serve the particular needs of this broad array of decision makers. Certain decision makers, for example Governors, have needs for only certain kinds of information and not for other kinds; the system must be capable of meeting these needs. In short, the system must be capable of screening and matching its reporting formats with the needs of particular users. In addition to questions of content, the screening and matching require attention to establishing the mechanism necessary to actually get the reports to decision makers and decision makers to the reports and, in the case of researchers, to the relevant portions of the data base itself.

Finally, the process for getting information out of the system has to pay serious attention to timing. Unless the information is available when needed, the content and form of the reporting mechanism makes little difference. Timing involves setting priorities for reporting different sets of information to different users, as well as priorities for providing different users access to different sets of information.

In summary, a national educational information system must be capable of delivering periodic and differentiated reports on the status and progress of schooling to a broad array of local, state, and national decision makers, as well as making available to different users, including researchers, special reports on and public use samples relevant to particular aspects of elementary and secondary schooling in the United States and in the several states.

A Mechanism for Cooperative Engagement

To develop the detailed design for the new National Data System, the Center, working through the Chief State School Officers, should establish a consortium of all states and develop an agenda for identifying specific information elements and data elements required for the system. The Center should also appoint a number of other members to the consortium, including representatives of local education agencies, academia, and others concerned with information about the educational system. The consortium should also have a say about the method in which the data base is organized and what data, in what form, would become available.

It would be foolish to believe that a body representing this large a constituency could do the detailed planning required for this effort. There would be an obvious need to develop working groups to address specific issues. For example, several states are in the process of developing state level integrated information systems; each is designed to provide the specific data needed for state purposes. In order to foster the development of compatible systems to produce comparable data, the Center should attempt to organize a working group of the consortium consisting of states already developing such systems, along with other states interested in similar development. Since in general the systems would be integrated, it would be essential for local systems to be represented. This would facilitate the exchange of information among the states and the development of alternative models which could feed the national data base.

Although the Center would have the responsibility for staffing the consortium and establishing working groups for the various technical issues which will have to be addressed during the development of the system, the total input to the Center should more than compensate for the cost of staffing.

Recommendations

1. The Center for Statistics should create a national data base of micro records for pupils, educational personnel, districts and schools, both public and non-public.
2. The national data base should
    - a. incorporate relational linkages among files,
    - b. cover family and community environment, educative difficulties of pupils, resources, goals, schooling process, and outcomes,
    - c. accurately represent the nation as a whole and the individual state educational systems which compose it and, therefore,
    - d. permit accurate comparisons of state educational systems.
3. This data base should form part of a comprehensive national education information system incorporating;
    - a. options for state participation in data collection, and
    - b. a comprehensive system of data access and dissemination.
4. The system should be phased with a planned schedule of development and partial implementation leading to full implementation within five years.

Part I. Context, Needs and Rationale

Chapter 1

Changes in Education and Changing Demands for Information

The most important fact about elementary and secondary schooling in the United States today is that there is almost universal dissatisfaction with its quality. This dissatisfaction, in turn, has begun to force major changes in the educational system; and these changes are taking place within new contexts for making educational decisions. No longer do these decisions fall within the exclusive purview of local school boards and local school administrators. Parents are exploring new alternatives for the education of their children. State officials and public bodies are expanding the range of their actions in attempts to improve the quality of schooling. And information about the quality of education--about the quality of schools, school districts, and state educational systems--has become a priority concern for the increasing array of new policy actors now involved in making decisions that affect the quality of the education being received by the Nation's children and youth.

A. Rising Public Concerns About Educational Quality

Dissatisfaction with American education has been building for a number of years. During at least the last ten to fifteen years, American education has been experiencing a growing period of unrest, of harsh criticism of its practices, of general skepticism about its ability to serve the Nation. Reports of declines in SAT scores, of unfavorable comparison of achievement levels among American youngsters and their counterparts in Japan and European industrial nations, of the lack of teachers adequately prepared to teach math and science (or other subjects for that matter), of high school graduates who are functional illiterates, all have been producing a rising sense of alarm among the American public. The 1970's and early 1980's saw a growing feeling on the part of the citizenry that many of our Nation's young people were not being properly prepared for entry either into colleges and universities or into the American work force. These sentiments perhaps were expressed most visibly in the recent report of the National Commission on Excellence which contends that "...the educational foundations of our society are being eroded by a rising tide of mediocrity."

But the Commission's report, in truth, made no new discoveries. Well before the issuance of A Nation at Risk concerns about the serious problems of the schools had been receiving increasing attention from a number of writers:

> Looking back, we can now see that by the late 1970's a critical mass of writers, intellectuals, and academics--few of them deeply into the educational establishment--were beginning to be heard on the failures of the schools: Diane Ravitch, Chester Finn, Dennis Doyle, Tommy Tomlinson. At the very end of that decade, one was aware that a number of large studies of high schools were under way--by James Coleman, Gerald Grant, John Goodlad, Ernest Boyer, Theodore Sizer--all inititated by mounting uneasiness about the condition of secondary education (Adelson 1985).

In the early 1970's, an air of discontent about the quality of secondary schooling in this country led the Charles Kettering Foundation to establish a National Commission on the Reform of Secondary Education. The Commission's charge was to:

> ...make a comprehensive examination of secondary education and provide the American public with a clear, factual picture of their secondary schools, indicating where and how they can be altered to better serve the Nation's young people (National Commisison on the Reform of Secondary Education 1973).

In the middle 1970's, nationally syndicated columnist Neal R. Pierce, writing in the Washington Post captured the growing discontent among the Nation's governors on matters of public education. He noted, for example, that Richard Snelling, the Governor of Vermont, was suggesting that the public schools were performing their roles so poorly, "that President Carter should call a Constitutional Convention on education in America." In Pierce's words:

> The hard facts are that in schools from coast to coast, verbal and mathematic Scholastic Aptitude Test scores have fallen steadily since 1963--almost without regard to whether the school system is poor or rich, center city, suburban or rural. Reputable surveys have shown that 12 of every 100 17-year old high school students are functionally illiterate, that scarcely 50 percent know that each state has two senators or that the president can't appoint members of Congress...No one believes the schools' problems will be quickly or easily solved. But across the nation, the ferment for change is growing rapidly (1977).

The growing ferment that Pierce described produced a number of common themes--themes expressed not only by governors, but by state legislators, state education officials, education interest groups, and increasingly by parents and coalitions of parents and other concerned citizens. Chief among these themes was a call for a return to the basics, a demand for stricter school discipline, a demand for minimal competency testing, and a growing resentment against an educational establishment that constantly sought more funds but stubbornly resisted external monitoring.

Other journalists, in addition to Pierce, were increasingly writing about the problems faced by the Nation's schools; and many were entering the growing search for "effective schools." Robert Benjamin, one of many writers supported under the Ford Fellows in Educational

Journalism Program of the Washington, D. C.-based Institute for Educational Leadership (Brundage 1977) chronicled his coast-to-coast search for effective schools in a 1981 book, Making Schools Work. In his introduction, Benjamin captures both the sense of increasing public alarm over the plight of the schools--particularly the urban schools, and the importance of broadening the stakes beyond those of the professional educator:

> The quest was hopeful: What makes schools work well? But it was set against a discouraging backdrop: the persistent failure of this nation's public schools to educate low income students by even minimal standards.
>
> It was a reporter's journey, rather that a professional educator's. It was undertaken with the belief that the benefits of this viewpoint outweigh its limitations, that all of us have a clear stake in shaping the solutions to what may prove to be the most challenging problem facing America's cities in the 1980's (1981).

Concerns about the quality of the Nation's schools also increasingly were being expressed by the business community which say, in the failures of the schools, serious problems for the national economy and grave threats to America's traditionally favored position in the world of international competition. Calls for deepened business community involvement in the schools were forthcoming from a number of quarters. The New York Stock Exchange, in its report, People and Productivity: A Challenge to Corporate America, advocated a strong effort to raise business' awareness about their stake in the problems the schools were facing: "We must understand that schooling is a long-term investment in human capital, and that productivity suffers when that investment is neglected" (1982). That the business community did become aware of the problems and did move to become involved is evidenced in part in one of several major education reform reports released during 1983, Action for Excellence, the report of the Task Force on Education for Economic Growth, whose membership consisted primarily of governors and business leaders from some of America's major corporations, rather than professional educators. The Task Force report argues that:

> Technological change and global competition make it imperative to equip students in public schools with skills that go beyond the "basics."...Mobilizing the education system to teach new skills, so that new generations reach the high general level of education on which sustained economic growth depends, will require new partnerships among all those who have a stake in education and economic growth.

Thus, by the middle of the decade of the 1980's, public education had become an object of great concern to a wide array of Americans--to parents, to other citizens, to state education officials, to governors, to state legislators, to broad-based interest groups, to the business community, and to a host of other Americans who now began to see themselves as increasingly important stakeholders in the Nation's schools.

Fortunately, in our view, the U.S. Education Department and the Office of Educational Research and Improvement (OERI) view the current climate of reform as an opportunity, "to sieze the day," to develop the new data acquisition programs that will provide the public the information that it needs and wants, the policy makers the information they need to judge the efficacy of the reform efforts, and the educational community the information it needs to monitor these efforts over time. In our view, the Elementary/Secondary Education Redesign Project comes at a most opportune time, a time when our long-standing faith in the American public school system is being seriously challenged, a time when serious minded reformers are proposing substantive changes in traditional modes of school operation, at time when the education community has begun to fashion exciting and promising responses to these calls for reform, and a time when an entirely new configuration of education information and data needs is presenting itself.

B. The Changing Nature of Educational Decision making

In the opening paragraph, we noted that growing dissatisfaction with the quality of schooling has begun to force major changes in the educational system, including major changes in the contexts in which educational decisions are being made as well as major changes in the cast of educational decision makers. These changes forced an opening up of the decision making process and resulted in almost totally erasing public education's traditional identity as a separable and special governmental operation. These changes resulted in pulling educational issues into the political mainstream; in opening up the system to parents, to the general public, to general government, and to special interests; and in forcing professional educators to integrate diverse segments of the community into the decision making and policy making processes of education.

American public education, for a long time, enjoyed an identity as a separable and special governmental operation. It was viewed by many as almost sacred. Its basic liturgy held that education was a unique function of government; that it must have its own separate and politically independent structure; that it should be uninvolved in "politics," indeed, that it should be divorced from politics; that professional educators alone should be involved in major decisions about education; that professional unity among educators was the norm. In effect, America's public schools were characterized by what political scientists would call "closed system politics." Schools were politically isolated, with tight boundaries, and neither elected politicians nor the general public nor parents had much success in cracking open the system and gaining access.

The state's policy role was minimal. Most states left most educational matters to local discretion. But those times have passed--perhaps forever. In state after state, public education has lost its privileged place as a unique governmental function. It is, more and more, beginning to be seen as just one of several human services competing for the public dollar.

At the local level, the Nation has witnessed and continues to witness a redistribution of the political influence previously held almost exclusively by professional educators and primarily by local school superintendents and local school boards. Parents, teachers, minority groups, students and others have successfully pressed their cases. They have gained access to and have assumed significant roles in the educational decision making process. And, of late, this has been extended from the school district level to the school building level. As one observor puts it:

> The classic debate regarding levels of authority and devotion to local control has expanded recently. Historically . . . [the] concern was freedom from encroachments from federal or state government. Now district level authorities are concerned about encroachments from below, i.e., citizen advisory committees at the building level and principals who believe in the concept of site management (Campbell 1980).

But it is at the state level that perhaps the most profound changes are taking place. New configurations of political power have emerged. In state after state, governors and legislators have superceded the traditional custodians of educational legislation and are assuming an increasing role in the decisions about the financing and control of the schools. As one looks across the Nation, one sees that policy decisions about education are more and more being hammered out in legislative halls and chambers, in governors' offices, in state board rooms, in the offices of associations and interest groups, and less and less in the offices of local school superintendents and the meeting rooms of local school boards.

Over the past fifteen to twenty years, the Nation also has witnessed an unprecedented involvement in public education by the federal government--the courts, the Congress, and the executive agencies. We now have a cabinet level Department of Education. And despite its traditional junior or minor role in school finance, the federal government has become a significant force in American education. At the K-12 level, federal expenditures rose from $642 million in 1960 to over $15 billion in 1985--a twenty-three fold increase and a significant amount of money, even if it covers only 7 to 8 percent of the cost of operating the public schools. And the Congress has not been content to play the silent banker; it also has directed how school districts should spend the funds. Furthermore, in its oversight role, the Congress has called on the federal adminstrative agencies to monitor closely the expenditure of those funds. While recent efforts of the Reagan Administration to return more responsibility and decision making authority to the states have achieved some modest successes, it appears that the federal government's involvement in education is not likely to diminish significantly in the immediate future.

Thus, at this time in our history, we find that the policy process--the power structure of American education--is no longer a tightly-knit or closed system. Intervention in the policy process has become generally open to any individual or group who can claim to represent a constituency, who can gain access to information, and who is familiar with the points of access into the system.

Nor is the educational policy process monolithic, fixed, or static. Educational decision making has become an evolving, interactive process open to external ideas and influences, involving many individuals and groups, involving all levels of government, and all levels of organization and program administration. But it is not only the locus of educational decision making that has changed. The cast of educational decision makers has been greatly enlarged--parents, other citizens, representatives of interest groups, educators, executive staff executives, legislative staff legislators, governors, Congressional staff all have become participants in the process.

C. The Catalytic Role of "A Nation at Risk"

As the Nation approached the middle years of the 1980's, reform was in the air. Study commissions were being established. States were considering major reform efforts. But it was the Report of The National Commission on Excellence, A Nation at Risk, that truly caught the public's eye, moved education to the "front burner" as a critical public policy issue, and served as the catalyst for a spate of reform activity across the Nation. Since the publication of A Nation at Risk in 1983, the country has been literally besieged with calls for educational reform, calls that have issued from national, state, and local levels, from public and private sectors, from academe, from business and industry, from parents and other individuals--in short, from virtually all quarters. Governors have created their own committees on excellence, state legislatures have proposed and enacted a bevy of reform statutes, state boards of education have issued blueprints for action, local school districts--often in concert with local business and industrial interests--have established their own reform committees. One observer describes the phenomenon as "a kind of rising Greek chorus of educational reform that is sweeping across the Nation."

The reforms, and calls for reform, cover a broad range. In a great many states and locales pupil testing has taken center stage for any number of different reasons--to identify curricular strengths and weaknesses, to allocate resources, to select pupils for remedial assistance, to evaluate school and program effectiveness, to certify promotion and graduation, and to report status and progress to the general public. But pupil testing is only one target of current reform efforts. Merit pay systems and career ladders for teachers also have caught the reformer's and the public's eye. The Commission on Excellence urges that salaries of teachers "be professionally competitive, market sensitive, and performance based" (1983). A second national report, the Twentieth Century Fund's Making the Grade, proposes "reconsideration of merit-based personnel systems for teachers (1983). A third major report, Action for Excellence, issued by the Education Commission of the States, advocates development of "ways to measure the effectiveness of teachers and reward outstanding performance (1983).

The high school curriculum also has become a priority target for reform efforts, most visibly in the Commission on Excellence's recommendation that all students seeking a high school diploma be required to "lay the foundations in the Five New Basics"--to take 4 years of English, 3 years of Math, 3 years of science, 3 years of social studies, and 1/2 year of computer science (1983). This particular recommendation, coupled with the Commission's call that "significantly more time be devoted to learning the New Basics (1983) have served as an impetus for many states, as well as hundreds of local school districts across the land, to propose and in many cases adopt new high school graduation requirements and extend the length of the school day if not the school year.

Another abiding theme reflected in current nationwide reform efforts is the training and retraining of educational leaders--the men and women who fill the administrative and managerial roles of public and private education in America. This theme, in particular, is often woven together with a second theme--joint, cooperative efforts between the education and business communities. Business and industry are looked to not only as the consumers of the schools' products, i.e., educated and trained workers, but also as valuable resources in the design, implementation, and support of training programs aimed at developing excellence among education's administrators and managers and the school programs for which they are responsible (1983).

Parental voice and parental choice have become a cause celebre of many of the reform efforts. There is a growing feeling that American society has surrendered too much responsibility for schooling to governmental bureaucracies and professionalized institutions and, thereby, neglected the more human-sized groups, what Peter Berger and Richard Neuhas have called the "mediating structures" of society--such as families, communities, voluntary organizations, and religious groups (1977).

There are numerous other targets of current reform efforts--revitalization of teacher training institutions, improvement of knowledge dissemination practices, integration of education and technology, better fits between education and employment, to name a few. And as we noted earlier, even though A Nation at Risk served as a major catalyst for the current reform movement that has swept the country, the calls for educational reform and the responses to these calls did not necessarily await the publication of A Nation at Risk. A good many reform efforts already were well underway before the Commission on Excellence sounded its general alarm. For example, the effective schools movement, which has been a powerful driving force for change in the schools and, at least in the minds of some, has been eminently successful in improving school learning for a great many youngsters, considerably pre-dated the release of the Commission's report as well as the several other reform reports which have received nationwide attention.

But irrespective of the sources of the impetus for any particular reform effort, what appears central to all of them is an almost universal call for data--data on how students are doing in our schools, on what they are learning, on their levels of achievement; data on how teachers are doing, on what constitutes good teaching, on the mix of conditions necessary to ensure that our professional teaching ranks become filled with "the best and the brightest;" data on curricular programs, on effective instructional practices, on new ways of learning; data on the context in which schools operate, on the climate in the classroom, on family, social and economic environments; data on resources, on the most effective mixes and uses of resources, on resources and equity issues; data on alternative approaches to schooling, on the private sector of schooling, on choice within the public sector.

We see, then, as we enter the final years of the decade of the 1980's, American education--particularly as it takes place in our elementary and secondary schools--deeply immersed in a reform effort similar to what the Nation experienced following the general alarm raised in 1958 by the Russian launch of Sputnik. Whether one fully agrees with all of the cries of alarm and calls for reform now being sounded across the country, one has to acknowledge that American education--particularly at the elementary and secondary level--currently is in a state of ferment and, consequently, open to massive changes in its traditional modes of operation. As noted in the Synthesis Report, Usdan, in citing Kirst's attention cycle, contends that we have passed through the stage of "alarmed discovery" and are now in the midst of a second stage of "crisis activity" (Gwaltney and Balcomb 1981). However, as Usdan further contends, the reform movement can only endure if the effectiveness of specific reforms can be proved (1981). But to demonstrate the effectiveness of the reforms, one needs information substantially different from that which we traditionally have gathered, and that information needs to be provided to a substantially different group of users.

D. New Users of Educational Information

As we noted earlier, in the past the primary information users were the education professionals responsible for conducting the educational process. These decision makers participated in local information systems focused around day-to-day decisions made by teachers and administrators. Such information systems generally were limited to providing basic data on the local level about pupils, personnel, educational services, and finances. Now, however, we are finding that information must be conveyed beyond the boundaries of the local educational agency. Parents need information about the character and quality of the educational alternatives available to their children. The citizenry--local, state, and national--requires and is demanding information about the quality of its schools. The business community--at local, state, and national levels--is calling for systems that will provide quality assurance information on the schools. State officials--governors, legislators, state school board members, officers of state education agencies--require more comprehensive and accurate information on the quality of the schooling being conducted within their purview. Federal officials--from the President through the Congress to the agency administrators--are seeking information on the general condition of American education, as well as on the effectiveness of federal education policies and programs.

We alluded earlier to a growing feeling among the body politic that American society has surrendered too much responsibility for schooling to governmental bureaucracies and professionalized institutions. There is a rising demand for parental voice and parental choice in the education of the young; in many locales, parents have moved to excercise more voice and more choice in these matters. As a result of becoming increasingly important actors in the policy process, parents also have become information users. They have sought information to help them fashion plans for decentralization, school site management, parent advisory councils, and other proposals designed to get around the entrenched school bureaucracy. They have sought information to help them make choices about the schools to which they send their children, choices within the public sector as well as choices betweeen the public and private sectors. But too often the needed information has been lacking. James Coleman, in his invited paper written for the redesign project, argues that NCES data activities can be used to help correct this situation, to augment parental resources by "encouragment and facilitation of parental and community use of information about student performance and school functioning." In Coleman's view, NCES ought to act, in effect, as "a representative of the consumers of education," informing parents of their information rights with respect to both public and private schools, providing to local districts which are so inclined specifications for appropriate consumer information systems, and designing consumer information systems to accompany school choice plans developed for use within public school systems, as well as those that include nonpublic schools (1985).

The general citizenry--as well as parents--also have become growing users of information on the schools. They want to know what the schools are doing. They want to know what and how well children and young people are learning. Citizens want to know if the schools are equipping the young for productive employment. They want to know if the schools are developing in the young an understanding and appreciation of our democratic form of government. They want to be able to compare their local schools with other schools, their state educational system with other state systems, the Nation's schools with the schools of other nations. They want to be assured that their tax dollars are being well spent. In short, they want to know how well the educational system is working, how far it is from attaining excellence, how far it is from attaining equity. As James M. Banner, Jr., in his invited paper put it:

> For good or ill, the American public now seeks to be assured of improvements in education at all levels, especially in the primary and secondary schools. And, characteristically, it wants information that compares present conditions with those of the recent past and conditions in one jurisdiction with those in others. Yet the plain fact of the matter is that the data available to provide such comparisons is embarrassingly weak. The public is being mislead by their use (1985).

It is abundantly clear that citizens are calling for more comprehensive and more accurate information on their schools--information to use in their educational policy making roles as persons interested in the general condition of the schools, as voters on local tax issues, and as members of interest groups working to influence policy development at local and state levels if not the national level.

The business community, too, has become a user of educational information. It wants assurance. It wants assurance that fair and objective data on the perfomance of teachers are available. It wants assurance that information on the certification of teachers and administrators is available. It wants assurance that rigorous criteria for selecting and retaining teachers are being adopted and implemented. It wants assurance that fair and objective data on student performance are available. It wants assurance that the schools are preparing the young "for productive participation in a society that depends ever more heavily on technology, . . . "(1983). And the latest entry in the long list of reports on American Education, by the blue-ribbon Committee for Economic Development (CED), corroborates this contention (1985). Dennis Doyle and Marsha Levine, in a recent article describing the CED report, write that:

> There is an opportunity today to forge a new quid pro quo between Americans and their public schools. There will be more money for education when there is more education for the money. The business community (at least, as represented by the CED trustees) stands ready to put its shoulder to the wheel to support public schools--including substantial increases in funding--when the public schools are willing to set and meet the objective of a high-quality education for every citizen (1985).

It goes without saying that, if the business community is going to make good on its commitment, it will need adequate, accurate and timely information on the progress of the schools.

State officials, as education has become more centralized and governance and control mechanisms traditionally left to local school boards have reverted to state school boards and state education agencies, if not to state legislatures and governors' offices, also have become increasing users of educational information. To a great extent the increasing call for and use of education data have been driven by the states' assumption of a more active role in the decision making process; but equal weight needs to be given to rising concerns about educational accountability. Legislatures are increasingly questioning the effectiveness of America's public schools; and increasingly they have assumed a more active role in education decsion making. Fuhrman and Rosenthal argue that ". . . legislatures have taken on the role of pre-eminent education policy-makers in some states; in many others they are at least co-equal partners; and in only a few are they still secondary (1981). As such, legislators have made increasing demands on state agencies for more accurate, more comprehensive, and more timely data on the quality of public schooling. Governors, too, have become ardent consumers of educational information as they have moved to enter the education policy arena and mount their own reform programs. They, like the members of the state legislatures, are no longer content with the traditional education information reports proferred in past years. They want information on the effectiveness, on the costs and the benefits, of the policies and programs mounted to improve the quality of schooling.

Chapter 2

Capabilities of Present Education Data Systems

In the previous chapter we have documented widespread demands for the reform of American education, and the myriad ways state governments, local education agencies, citizens' groups, and business and professional organizations are working to meet those demands. Coupled with demands for reform and actions to bring it about are new and increasing requirements for information on the status, condition, and functioning of schooling in the United States, and for information on education more broadly conceived. In this chapter we examine the capabilities of current educational data systems to meet these new requirements, and the consequent needs for reform of federal activities in the collection and dissemination of educational data.

At the core of new requirements is the need for an integrated program of data collection, analysis, and reporting, in contrast to the largely unarticulated set of data collection projects that presently operate at all levels of the education enterprise. Although major factors that influence the operation of the nation's education systems are inextricably linked ; e.g., changes in levels of educational resources produce changes in the availability and quality of education personnel, and these, in turn, produce changes in educational offerings and services, present data-collection projects are inadequate to describe and characterize such linkages. In many cases, the structure and articulation of interrelationships among components of the nation's education systems must be deduced from unexamined inferences or from incomplete and inappropriate empirical findings. No education data system or program adequately characterizes the whole of the education enterprise. Although relationships between educational resources, expenditures for personnel, and the quality of personnel are known in part, there is no integrated educational data system to document the extent and operation of such relationships, either for the nation as a whole or for individual states.

A. The Structure and Content of the Nation's Education Data Systems.

Responsibility for the collection and dissemination of information about education in the United States is fragmented. At base, much of the information currently collected is derived from administrative records. Most of these records are maintained by local education agencies and schools.

Local Education Agencies. Formal records in local education agencies are usually of six types:

- pupil records (e.g., cumulative folders, transcripts, etc.);

* instructional service records (e.g., curriculum specifications, courses offered, time schedules, lists of authorized textbooks, syllabi, etc.);

* personnel records (e.g., occupational categories, specific assignments, certification levels, college transcripts, application forms, etc.);

* financial records (e.g., accounting journals and ledgers, payroll records, etc.);

* records required by other agencies (e.g., health records, state- and federally-mandated records, etc.);

* policy records (usually special data collections or tabulations of administrative record data for policy formulation or administrative decision-making)

These records are the formal outcomes of "official" events that occur within the local education agency or within the schools operated by the agency. When students enroll, teachers are hired, purchases are made, grades are issued, or tests are taken, records are created, supplemented, or updated. Some of these records are initially maintained in separate school files -- e.g., student grades -- and then formally summarized and entered into central record systems. Unfortunately, the detailed content and organization of record systems vary from one local education agency to another. Both historically and currently this has caused massive reporting and summarization problems as records are transferred from local education agencies to state agencies or to other jurisdictions; inconsistencies in the types and forms of records kept by different local education agencies produce substantial differences in the meaning of data reported by those agencies. Common units of reporting and common definitions are necessary precursors of useful data aggregations, and these common elements often do not exist or are not used. The structure of record systems maintained by U. S. high schools, and the problems inherent in such systems, are discussed at length by Coleman and Karweit (1972).

The records maintained by local education agencies are seldom linked in any formal way. For example, although students' secondary school transcripts indicate the courses these students completed in a specific semester, they typically do not indicate which teachers taught the courses. And even when teachers are linked to courses, there is usually no feasible way to link this information to the teachers' certification levels or college transcripts.

State Education Agencies. Local administrative records form the primary basis for reporting information to state education agencies. States often control the form and content of these records (e.g., The Illinois School Student Records Act -- P.A. 79-1108). Usually a state education code specifies the content and timing of required reports to the state education agency. In California, for example, the State Department of Education issues a Data Acquisition Calendar twice a year covering state-mandated data collections and reports by local education agencies. This calendar also informs local education agencies that no data collections other than those listed are required by the state. In 1984-85, these semi-annual calendars contained twenty and nineteen pages, respectively.

One primary purpose of local agency reports to states is to determine the amounts of state tax monies local agencies receive in the form of general aid and program-specific funding. A second purpose is to monitor the compliance of local agencies and schools with the provisions of their state's education code. The information contained in these reports forms the core of the states' information systems about local education agencies and schools. However, this core is often supplemented by special-purpose periodic or *ad hoc* data collections conducted by the state education agency. A prominent example of such data collections is state testing or assessment programs. In most states, the results of special data collections, including student testing programs, are not integrated into a comprehensive educational information system. Typically, different subdivisions of the state education agency are responsible for, and use, different categories of data. Most often, distinct data files are maintained for the various purposes of the subdivisions. However, as new information technology has become available, some states have begun to design and operate more highly integrated educational information systems.

The U. S. Department of Education. The data-collection projects of the National Center for Education Statistics are central to the federal role in the collection, analysis, and dissemination of information about elementary and secondary education.

The current data-collection activities of the National Center for Education Statistics (as of fall, 1985) can best be described as a discrete set of projects, in contrast to a data program or system for providing information on the status of education in the United States. Funk and Wagnalls New Practical Standard Dictionary defines a program as "Any prearranged plan or course of proceedings," and the Oxford English Dictionary defines a system as "An organized or connected group of objects; a set or assemblage of things connected, associated, or interdependent so as to form a complex unity; a whole composed of parts in orderly arrangement according to some scheme or plan" (emphasis added). That the current data collection activities of NCES form neither a program nor a system is amply documented in the public discussion draft of the Synthesis Report produced for the NCES Redesign Project, and in the 60-odd papers that underlie that draft. Hence our use of the term "projects" in describing current NCES activities.

NCES collects data on education from two primary sources. Contracts with most state education agencies and less-formal arrangements with others provide for acquisition of a "Common Core of Data" that is secured and reported by states from the administrative records of local education agencies and the State's own records. These data are provided annually by every state education agency for a census of local education agencies in the United States. The quality and completeness of these data depend on the skill and interest of personnel in local and state education agencies, and on the provisions of state regulations concerning data required from local education agencies. NCES serves as a recipient and compiler of the Common Core of Data, rather than as a proactive collector of the data. It should also be noted that NCES does not conduct systematic audits of the data supplied by the states.

The second principal source of NCES data is a set of occasional and periodic cross-sectional and longitudinal sample surveys of local education agencies, school administrators, teachers, students, and parents. NCES survey data are, almost exclusively, collected by mail using pencil-and-paper questionnaires. Some NCES surveys are periodic (such as biennial surveys of public and private schools, conducted in alternate years), and others are occasional (such as a survey of recent college graduates who have received bachelors and master's degrees). In contrast to the Common Core of Data secured from state education agencies, data NCES collects through sample surveys are, with rare exception, obtained from nationally or possibly regionally representative samples of individuals, institutions, or agencies. These samples generally support estimation of parameters for a nationwide population of units, rather than estimation of state-by-state parameters. For some surveys, such as the National Assessment of Educational Progress (NAEP), reasonably precise estimates of parameters can be computed for regional populations.

A concise listing of the types of data collected through the current projects of the National Center for Education Statistics is provided in Appendix C of the Synthesis Report. The listing includes the population of inquiry, coverage, source, summary level, periodicity, and variables for which data are collected in every component of the Common Core of Data, in each of the major sample surveys NCES has conducted since 1980, and through the October Current Population Survey operated by the U. S. Bureau of the Census.

B. The Ability of Current NCES Data Projects to Meet New Demands for Information

Data Quality. According to authors of papers for the NCES Redesign Project, the deficiencies of data collection projects operated by NCES as of the spring of 1985 are legion. NCES data on the nation's systems of elementary and secondary education are claimed by these authors to be

- inaccurate (David, 1985, pp. 2-3; Eubanks, 1985, p. 1; Hawley, 1985, p. 2; McClure and Plank, 1985, p. 1; Murnane, 1985, p. 6; Walberg, 1985, p. 20ff; McDonough, 1985, in a letter);
- imprecise (Barro, 1985, p. 16; Harrison, 1985, p. 2; Hawley, 1985, p. 19; Hilliard, 1985, pp. 11 and 15; Lehnen, 1985, p. 4; Murnane, 1985, p. 2; Rosenholtz, 1985, p. 2; Selden, 1985, pp. 15 and 17; Thomas, 1985, p. 5; Valdivieso,1985, pp. 1 and 13)
- inadequate in scope and coverage (Banner, 1985, p. 7; Barro, 1985, pp. 2,4 and 9;

Bishop, 1985, p. 18; Eubanks, 1985, p. 2; Hannaway, 1985, p. 1; Hersh, 1985, p. 11; Miller, 1985, p. 1; Natriello, 1985, p. 3; Odden, 1985, p. 5; Peterson, 1985, pp. 11 and 12; Reisner, 1985, p. 2; Scott-Jones, 1985, p. 5; Selden, 1985, p. 1; Thomas, 1985, pp. 2ff.);

* inappropriate (Banner, 1985, p. 6; McClure and Plank, 1985, pp. 10 and 14); and
* lacking in timeliness (Berryman, 1985, p. 17; Grant, 1985, pp. 2 and 3; Harrison, 1985, p. 2; McClure and Plank, 1985, p. 14; Reese, 1985, letter).

On the last point, W. Vance Grant, head of the NCES Statistical Information Office, compiled a list of the most recently available statistics that can be used to fulfill requests for information most frequently sought from his office. As of July 1985, no data more recent than Fall 1983 statistics on enrollments by grade were available to satisfy such requests. The most recently available information on school employees was, for most data items, for the 1979-80 and 1980-81 school years, with limited data available for Fall 1981. A great deal of data on pupils, such as school attendance and membership, and enrollments in high school subjects, were most recently available for the 1980-81 or the 1981-82 school years. Fiscal data, including information on local education agency revenue receipts and expenditures, were available most recently for the 1982-83 school year, but many data items, such as expenditures for salaries of nonprofessional school staff and expenditures for school library books, instructional supplies, and other instructional expenses, had not been compiled for school years later than 1975-76.

Judging the accuracy of statistics reported by NCES is difficult, since clearly-correct standards are often unavailable. Nonetheless, the examples of questionable results cited by Cooke, Ginsburg and Smith (1985), and Plisko, Ginsburg and Chaikind (1985) bring to mind the old adage "When the clock strikes 13, you begin to doubt the clock...". These papers raise questions about the validity of data supplied to NCES by other agencies, as well as the validity of data collected by NCES. In some instances, problems of definition lead to markedly different reports on purportedly identical variables. Cooke, et al. (1985, p. 8) cite the nationwide high school dropout rate, reported as 27 percent by NCES, and only 16 percent by the Census Bureau. Plisko, et al. (1985, p. 10) rightly question the large variability among states in the percentage of enrolled students who are classified as "special education students." States reported as few as 5 percent and as many as 13 percent of their enrolled students in special education categories. These authors (Plisko, et al., 1985, p. 10) conclude: "There is no physiological explanation that could account for these report [sic] differences exceeding 100% in the prevalence of handicapping conditions."

Plisko, et al. also report highly implausible year-to-year and state-to-state variations in basic statistics that compose the Common Core of Data. Although the National Education Association (1985) refers to the Common Core of Data as the "cornerstone of educational information in the United States," Plisko, et al. note such anomolies in Common Core of Data statistics as variations in pupil-to-staff ratios of 140 percent across states within the same academic year, and wide variations in pupil expenditures within states from one year to the next.

An obvious data quality problem arises from the dependence of the U. S. Department of Education on the accuracy of statistics reported by state education agencies. In such programs as the Common Core of Data and the Vocational Education Data System (VEDS), the federal agency merely aggregates, compiles, and reports the data supplied by state agencies, in the absence of an effective auditing or quality control function. Cooke, et al. (1985, p. 6) cite as flagrant inaccuracies, the State of New Jersey reporting 50 percent more students enrolled in high school vocational education courses than that state's total population of high school students, and the State of Virginia reporting that three times as many American Indian students were enrolled in vocational education courses, than were in the entire Indian population of Virginia. Whether these reports are necessarily in error is difficult to determine, since the definition of "course enrollment" is not made clear. It is impossible to determine whether these states were providing duplicated counts of individual students who enrolled in a number of different vocational education courses during the same academic year, or were providing unduplicated counts of vocational education students, regardless of the number of courses in which they enrolled. If the former definition were used, the results cited by Cooke, et al. are still implausible but not impossible. If the latter definition were used, the results are clearly impossible.

Scope and Coverage of Data. Many authors of papers for the NCES Redesign Project cited inadequacies in the scope and coverage of data presently collected, and the inability of the present NCES projects to provide information that can be used to compare the condition and progress of education in the various states. The latter point will be considered first.

With the exception of the Common Core of Data, most of the data-collection activities of NCES support estimates of parameters only for nationwide, or occasionally for regional, populations. Yet education is an activity that is constitutionally reserved to the states and, as noted by many of the contributors to the NCES Redesign Project, the vast majority of important education policies originate at the state level of government. The need for education statistics that support comparisons across states has been strongly voiced:

> Lehnen (1985) stated:
> "National averages and other statistics do not reveal much about the state education systems ... Yet it is the states who will determine the direction and scope of education policy and not the federal government. Without this detail NCES data will have only limited utility for policy studies within the states."
>
> And the National Governors' Association (1985) noted:
> "In order to perform education policy setting functions, states need to plan, develop, implement, and evaluate education initiatives. ... national trend data and consistent and accurate data from all states for macro comparison purposes is of key interest ... samples

> should be examined to determine the feasibility of expansion to collect data more state specific."

> Finally, Odden (1985) suggested:
> "There is no question that the state is the primary actor in education policy ... federal data collection should reflect this fact. Thus data should be collected on a district and state basis; if a sample of district data are collected ... the sample should be REPRESENTATIVE FOR EACH OF THE FIFTY STATES."

Deficiencies in the scope and coverage of statistics presently reported by NCES are well summarized in the Synthesis Report, and span the content of all reasonable models for structuring data on status and change in U. S. education. Of even greater concern is the paucity of information essential to an assessment of the need for, and the consequences of, the reform actions that are currently reshaping American education.

In the first chapter of this report, we described the rapidly-changing face of U. S. education policy. A plethora of reports on the quality of American education, including those of The National Commission on Excellence in Education (1983), The Education Commission of the States (1983), The Twentieth Century Fund (1983), and The Carnegie Foundation for the Advancement of Teaching (Boyer, 1983) have called for major reform of public school resource allocations, curricula, requirements, instructional patterns, certification routes, etc. Many authors of papers prepared for the NCES Redesign Project document the inability of the current NCES data-collection projects either to substantiate the need for recommended reforms, or to support an investigation of their effects, should they be put into practice. Deficiencies cited were pertinent to analyses of:

* the allocation of educational resources

Available data on the allocation of educational resources among school systems within states, and among categories of students are meagre and outdated. Far more information is needed on the magnitude and distribution of various categories of resources to school systems, to schools, and to categories of students.

> For example, Barro (1985,pp. 4-5) notes that:
> "The NCES currently produces what might fairly be described as skeletal information on school finance. ... There are no NCES publications describing the distributions of revenues or expenditures among local school districts, either nationally or within states, even though such distributions (e.g., intrastate disparities) have long been the central concern of school finance policymakers and researchers."

* investments in and expenditures for education

Educational expenditure data collected by NCES are currently available only for gross categories of expenditures --"instruction, support services, and non-instructional services" -- that mask, rather than inform an accurate picture of the utilization of resources in school systems and schools. Again, Barro (1985; pp. 4-5) provides a useful synopsis of the deficiencies of currently-available data:

> "The education expenditure data currently reported by NCES are serviceable at best, for making gross fiscal comparisons among states and examining broad trends in public support for the schools. Even in those applications they can be misleading, because differences in dollar outlays among states and over time do not necessarily correspond to differences in educational resources. ... Two reasons for the limited usefulness of current data are that expenditure data are not collected in sufficient detail to be connected with resource categories, and expenditure and resource categories are not coordinated. Consequently, information on dollar outlays cannot be linked to anything real. Most expenditures of direct educational interest, in fact, are contained within the single, overbroad, traditional category, 'instruction' which is not decomposed either by type of resource or by the various purposes for which instructional resources are used."

Odden (1985; pp. 4-5) provides recommendations that are consistent with those of Barro. In response to new education reforms, he cites the need for detailed, state-comparable expenditure data by function (e.g., administration at the school system central office level, administration at the school building level, administration of special programs, instruction, transportation, and operation and maintenance of plant), and by program (e.g., regular education, programs for special-need students, categories of curriculum such as mathematics, reading, science, social studies, etc., and level of education, such as elementary, middle, and secondary). Odden notes that such data are central to emergent policy interests at both state and federal levels.

* the coverage and scope of curricula

Several authors noted that NCES currently collects little information on what is taught in schools, despite the heavy emphasis of the "reform reports" on strengthening school curricula. Hawley (1985) cited the absence of data on curricular scope and the level of difficulty of subjects offered in elementary and secondary schools. Cronin (1985) expressed concern that the suggestions for curricular reform contained in A Nation at Risk would lead to an overly narrow curriculum, but cited the paucity of NCES data that could be used to document current curricular breadth or curricular reform, should the nation's schools decide to follow the suggestions of the National Commission on Excellence.

* the nature of educational requirements and standards

Although the 1983 report of the National Commission on Excellence in Education recommended substantial increases in high school graduation requirements, NCES does not regularly collect data on current graduation requirements in school systems and states, nor on standards of quality imposed on school curricula or student performance. The High School and Beyond study collected data on the course-taking patterns of high school graduates, but these data were collected prior to the National Commission report and no comparable data that would support analyses of school systems' and students' responses to the National Commission report are currently collected by NCES or its contractors. Data on Carnegie unit requirements, reported by state in the 1985 edition of The Condition of Education were collected and reported by the Education Commission of the States.

Minimum competency achievement testing is another recent reform that is poorly understood, and for which impact data are neither collected nor made available by NCES. Although The Condition of Education (pp. 68-69) reports that competency testing was used as a high school graduation sanction in 24 states as of 1984 (based on data supplied by the Education Commission of the States), available data will not support analyses of the relationship between the use of competency tests and high school dropout rates, changes in high school curricula, or changes in students' patterns of course-taking.

* the extensiveness and quality of instruction

Not only are data on the structure and extensiveness of curricula in the nation's schools generally unavailable, we have even less information on what students are doing in our schools. As Peterson (1985; pp.3-5) noted:

> "To take the pulse of American education, we need to know what students are doing and learning in classrooms in the United States. ... Following publication of the Nation at Risk report in 1983, many states responded to the recommendations by lengthening the school day, many school districts set minimal standards for the number of minutes that teachers must spend teaching each of the major subject areas during a given week. The impact of these new guidelines on what teachers and students are doing in classrooms has not been assessed. "

Peterson also cites the lack of data on the quality of educational activities in our nation's schools. In particular, she notes the inability of a national commission on reading to detemine the amount of time teachers typically spend on the most important structural components of reading, such as phonics in the early grades or to determine the amount of time students spend engaged in such essential learning activities as silent and oral reading. Data on the amount of time students spend doing "seatwork" were collected in some local studies in the late 1970's, but no information is available on whether these students were engaged in any useful educational activity or were merely wasting time.

Hersch (1985) also described the importance of time devoted to instruction as a component of school effectiveness, and then noted the absence of NCES data on the distribution of instructional time across subjects and topics.

* the demographics of pupil populations

Several contributors to the NCES Redesign Project noted deficiencies in data presently available on the demographics of pupil populations. Although he credits NCES with some of the most extensive data available on Hispanics, Valdivieso (1985; pp. 11-13) cites the need for more extensive, and better-differentiated data on the educational characteristics and participation of Hispanics. He notes that NCES uses a general category labeled "Other Hispanics" in its data-collection and reporting and, in so doing, combines data for populations with very different cultural and educational backgrounds and needs. Valdivieso also calls for collection of data by "racial/Hispanic indicators" in the Common Core of Data.

Hilliard (1985, pp. 4-6) suggests that demographic data on pupil populations are essential to investigations concerning problems of equity in our nations schools. He notes that presently-collected data do not support analyses of inequities in the allocation of school resources to students of different racial and ethnic groups, nor do they allow satisfactory investigations of the educational experiences of students of different racial and ethnic groups.

Eubanks (1985, p. 3) suggests the need for better data on the relationships between students' social classes and their participation and success in the nation's schools. This need for additional data is also stated by Thomas (1985, p. 3) when she notes that schooling in the United States is still highly stratified by students' race and social class, and that data on such stratification "do not exist on a national basis."

* the context of education, both in and out of schools

Coleman (1985) builds a strong argument for the changing nature of educational demands placed on schools as a result of changes in family and community structure in the United States, including the prevalence of working mothers, and one-parent families, and the growth of "intergenerationally separate" social structures. To assess the need for school policies that meet these new challenges and the schools' success in doing so, Coleman calls for the collection of a wealth of contextual data not presently available from NCES, including data on the characteristics of students' families, data on the schools' relations to students' families, data on community organization, and data on the schools' relations to their communities.

Usdan (1985) suggests that data on education must go well beyond data on schools, and must include information on the societal context in which schools operate. He notes the increasing delivery of educational services by agencies and institutions outside the schools, such as private sector organizations, the military, and voluntary associations, and suggests that information on the extensiveness and quality of education services provided must be collected from these agencies and institutions, as well as from the schools. Usdan further notes the need for "social data" on such issues as the increased burden placed on the schools by single parents and the prevalence of "latchkey children," and the relationships between education and economic trends and employment opportunities in the communities served by the schools.

* the characteristics and quality of educational personnel

Perhaps the most dramatic changes in education policy can be seen in states' reactions to the public clamor for higher quality teachers. In recent years a solid majority of the states have adopted new and stiffer requirements for teacher certification, including demonstration of content knowledge and pedagogical knowledge by passing one or more tests, and demonstration of pedagogical skills by earning passing marks in an on-the-job evaluation. Incentives for joining the teaching profession have also been provided, through such major reforms as revision of salary schedules, adoption of merit pay plans, and establishment of career-ladder programs.

According to Anrig (1985):

> "One of the fastest-moving changes in this period of educational reform is in teacher testing. In as little as five years, state-required testing for aspiring teachers to enter preparation and/or to become certified has spread from a handful of states -- mainly in the southeast -- to a nationwide trend involving 38 states, with seven additional states currently considering a teacher testing requirement. In 1984 alone, nine states enacted teacher testing laws or regualtions."

Similar statistics are documented by Goertz and Pitcher (1985) and by Sandefur (1984).

Again, current NCES data-collection projects do not provide the kinds of information that must be available to assess the need for, and the impact of, these massive educational reforms. The Common Core of Data provides simple counts of full-time-equivalent staff employed in public elementary and secondary schools, and in public school systems, by state and by type of assignment (e.g., principal, assistant principal, classroom teacher, etc.). Although a recent sample survey will eventually produce statistics on teaching assignments, teacher training and teacher experience, at present data collected by the National Education Association provide the only information on such basic characteristics of the instructional workforce. The most recently published Digest of Education Statistics contains basic demographic and educational data on public school teachers (such as median age, race, gender, highest degree held) and a percentage distribution of public school teachers across subject areas, but all such data are for the 1980-81 school year, and all were provided by the National Education Association. To understand the need for, and the effects of, reforms in teacher selection, employment, and compensation, NCES must collect and report information on the recruitment and retention of teachers, in addition to statistics that will inform judgments on the quality of the instructional workforce. No such data exist for the nation, much less for individual states. Since reform actions differ substantially across states, state-by-state information will be essential to understanding their impact.

* the outcomes of education

Since the late 70's, more than two-thirds of the states have adopted some form of minimum competency achievement testing of students. In almost half the states, competency tests are used as a high school graduation sanction (Pipho, 1984). Although numerous educational researchers have speculated on the effects of minimum competency testing on high school curricula, teacher morale, student dropout rates, and school curricula (see Jaeger and Tittle, 1980), data currently collected by NCES offer little or no information that can inform such judgments. As we have already noted, NCES data provide no information on the breadth and depth of high school curricula or on the morale (or consequent career intentions) of teachers. And data on student dropout rate are highly suspect. To examine the effects of minimum competency achievement testing, we must have consistent state-by-state data on these factors, collected and reported over a number of years.

In summary, the context of American education is changing rapidly, with new educational policy that affects all participants and stakeholders. To understand the need for policy change, its short-term impact, and its long-term outcomes, will require a radically improved, and vastly modified, national elementary and secondary education data system.

Chapter 3

What Should be the Federal Role in Building a National Educational Information System?

A. The Mission of the National Center for Education Statistics

A unified and coherent program for acquiring, analyzing and disseminating information on the condition of education throughout the United States cannot exist without a centralized administrative unit within the federal government that has, as its sole mission, accomplishment of those goals. On March 1, 1867, the Congress acknowledged the need for an agency in the Executive Branch that would meet the nation's needs for information on education (Kursch, 1965; pp. 11-12). In establishing a department of education (without Cabinet standing) the Congress declared:

> "Sec. 1. There shall be established, at the city of Washington, a department of education, for the purpose of collecting such statistics and facts as shall show the condition and progress of education in the several states and territories, and of diffusing such information respecting the organization and management of schools and school systems, and methods of teaching, as shall aid the people of the United States in the establishment and maintenance of efficient school systems, and otherwise promote the cause of education throughout the country.
>
> "Sec. 2. There shall be appointed by the President, by and with the advice and consent of the the Senate, a Commissioner of Education, who shall be intrusted with the management of the department herein established, and who shall receive a salary of $4,000 per annum, and who shall have authority to appoint one chief clerk of his department, who shall receive a salary of $2,000 per annum, one clerk who shall receive a salary of $1,800 per annum, and one clerk who shall receive a salary of $1,600 per annum, which said clerks shall be subject to the appointing and removing power of the Commissioner of Education.
>
> "Sec. 3. It shall be the duty of the Commissioner of Education to present annually to the Congress a report embodying the results of his investigations and labors, together with a statement of such facts and recommendations as will, in his judgment, subserve the purpose for which this department is established. In the first report made by the Commissioner of Education, under this Act, there shall be presented a statement of the several grants of land made by Congress to promote education, and the manner in which these several grants have been managed, the amount of funds arising there from, and the annual proceeds of the same, as far as the same can be determined.
>
> "Sec. 4. The Commissioner of Public Buildings is hereby authorized and directed to furnish proper offices for the use of the department herein established."

Thus, from its very beginning, the central purpose and focus of the Department of Education was the collection, analysis, and reporting of information on the condition and progress of education, for the dual purposes of helping states and local school systems improve their effectiveness and informing the Congress on the general status of and returns to the federal investment in education.

In the General Education Provisions Act of 1974, as amended (Section 406(b), 20 U.S.C. 1221e-1), the mission of the National Center for Education Statistics was updated and made more specific:

> "The purpose of the Center shall be to collect and disseminate statistics and other data related to education in the United States and in other nations. The Center shall:
> (1) collect, collate, and, from time to time, report full and complete statistics on the condition of education in the United States;
> (2) conduct and publish reports on specialized analyses of the meaning and significance of such statistics;
> (3) assist State and local education agencies, including State agencies responsible for postsecondary education, in improving and automating their statistical and data collection activities;
> (4) review and report on educational activities in foreign countries; and
> (5) conduct a continuing survey of institutions of higher education and local education agencies to determine the demand for, and the availability of, qualified teachers and administrative personnel, especially in critical areas within education which are developing or are likely to develop, and assess the extent to which programs administered in the Education Division are helping to meet the needs identified as a result of such continuing survey."

B. Assumptions Concerning Federal Participation in a National Educational Information System

A central assumption of this proposal for a national educational information system is embodied in its title -- that it be a national information system, not solely a federal information system. This objective can be realized only by recognizing that education is a function principally reserved to the states and, for many of its most fundamental operations, delegated by the states to local education agencies. If information concerning education is to serve as a stimulus for reform and a guide to achieving its success, it will be through the efforts of policy-makers and educators at all levels of government. A national educational information system must be designed to serve all of these constituencies.

Although the federal government has had profound effects on U. S. education in the last three decades through a plethora of policies concerning such diverse issues as equality of educational opportunity, the burden imposed on local school systems by federal installations, the quality of education provided to children of the poor, the educational opportunities and services afforded handicapped children, the rights of non-English-speaking children to instruction in their native language, and the quality of education provided to children of migrant workers, the federal government manages education only on American Indian reservations. In general, the management of education is wholly reserved to the states and, through state statutes, delegated in part to local education agencies. Therefore, state education agencies and local education agencies have need for management information as well as information on the effects of their education policies, while the federal government, apart from its need for small amounts of data to enforce regulations concerning the operation of federal education programs, needs policy information.

The distinction between information required for management and that required for policy analysis is more than superficial. To manage effectively, an agency must have comparable information on **every** administrative unit within its purview. To assess the need for, and the effects of, educational policies, information on representative samples of units will suffice. The substantive distinction between management (a tactical concern) and policy analysis (a strategic concern) also implies the need for somewhat distinct types of information. Thus, the content of an educational management information system would be somewhat distinct, but far from entirely distinct, from the content of an educational policy information system.

In an effectively designed national educational information system, the needs of data users at all levels of government, in addition to the data needs of consumers of education, would be considered. The education information system proposed here is principally designed to meet the policy information needs of the federal government, while stimulating, supporting, and complementing systems designed to meet the policy information and management information needs of state governments and local education agencies. It explicitly seeks to meet some of the information needs of consumers of education.

Past experience has shown that any attempt by the federal government to **impose** a uniform information system, designed to meet all federal and state needs for educational information, is doomed to failure. Users of educational information at all levels of government must decide for themselves what information they need and what information they will use. However, the time for cooperative development of a national educational information system, designed and maintained by a coalition of concerned policy-makers and educators at federal and state levels, is now. This view is endorsed by the U. S. Department of Education (as evidenced by this NCES Redesign Project), by the Council of Chief State School Officers (as evidenced by their June 19, 1985 letter to the Administrator of NCES and by their accompanying position paper on the Redesign Project, which stated, in part:

> "The Council believes that the National Center for Education Statistics has a vital role in responding to educational needs in the following general areas:
>
> ...
>
> 4. Assistance to state and local agencies in the design and operation of activities at the state and local level."),

and by the Council of State Governments (as evidenced by their 1985 position paper on the NCES Redesign Project, which stated, on pp. 8-9:

> "What remains [for NCES] is the problem of identifying the best means of providing useful statistical information to the [state-level] political decision makers within their unique environment. Given that information is 'that which reduces error,' we should conclude that providing better, more useable, statistical information to these important political actors will encourage improved educational policy decisions ... in the same way that providing better information to SEA and LEA leaders has improved their capacity to make better decisions.").

In an era of federal retrenchment in which the Administration has issued a clear call for less, rather than more, involvement by the federal government in areas not clearly within its purview, a proposal for federal leadership in the development of an integrated national educational information system might appear anachronistic. Yet such a leadership role is clearly within the statutory authority of the National Center for Education Statistics. The General Education Provisions Act of 1974 (Section 406(b), as amended in 20 U.S.C. 1221e-1) defines as a part of the NCES mission:

> "(3) assist State and local education agencies, including State Agencies responsible for postsecondary education, in improving and automating their statistical and data collection activities."

A central assumption underlying this proposal for a national educational information system, and for a strong federal role in developing and maintaining that system, is that the proposed federal leadership position in developing such a system is an essential part of the Congressionally-defined responsibility of the U. S. Department of Education.

This plan for a federal elementary and secondary education data program is based on a set of assumptions concerning the willingness of the Department of Education to modify its current data-collection activities and to invest the resources necessary to develop an adequate education statistics program. In particular, we assume the following:

(1) All current NCES projects concerned with data on elementary and secondary education can be eliminated, replaced, modified,or left untouched to the degree necessary to effect an adequate program for collecting, analyzing and reporting data on the condition of education in the United States;

(2) A new program for collecting, analyzing and reporting data on the condition of education in the United States need not be constrained by the funds currently allocated to the National Center for Education Statistics;

(3) A new program for collecting, analyzing and reporting data on the condition of education in the United States need not be constrained by the present administrative organization of the U. S. Department of Education;

(4) A new program for collecting, analyzing and reporting data on the condition of education in the United States need not be constrained by the present administrative organization of the National Center for Education Statistics;

(5) A new program for collecting, analyzing and reporting data on the condition of education

in the United States and foreign countries need not be constrained by the present functional responsibilities and mission of the National Center for Education Statistics;

(6) A new program for collecting, analyzing and reporting data on the condition of education in the United States should be designed explicitly to meet a range of well-defined needs for information on education and schooling; that is, the content and organization of the program should be determined by a well-conducted analysis of the needs of data users.

C. An Expanded Mission for the National Center for Education Statistics

Many contributors to the NCES Redesign Project view the 1974 statement of the Center's mission (defined in the General Education Provisions Act, as cited above) as inadequate to the need for such a center, and, as a step backward from the original charter of the Department of Education. Although the 1974 mission statement defines a specific set of responsibilities for NCES, it does not empower a unitary federal agency with sole authority and responsibility for informing the nation on that sector of society labeled "education." As a result, NCES does not do enough and other agencies of the federal government, both within and outside the Department of Education, do too much in their quest for data on schooling and education in the United States. Unnecessary duplication, lack of coordination, and excessive respondent burden are well documented in the papers prepared for the NCES Redesign Project.

The mission we would propose for NCES would make it the federal agency with authority and responsibility for collection of data concerning education in the United States. Other agencies with specific needs for regulatory data on education (such as the Office for Civil Rights, other agencies within the Department of Education, the Department of Labor, the Department of Agriculture, and the Department of Defense) might collect such data, provided their activities were coordinated by NCES, and only in situations where NCES was unable to meet their programmatic needs for such data.

Our position on an appropriate mission for NCES is consistent in spirit with that advanced by the Council of Chief State School Officers (1985):

> "We strongly urge that the function [of NCES] be a true statistical center that assumes the major responsiblity for coordination of the collection, assembly, analysis and dissemination for that sector of society under its purview, namely education.
>
> "The Secretary of Education would be required to make a clear and committed designation that the Center would have responsiblity for coordination of statistical data collection and analysis activities across the Department of Education regardless of organizational lines and/or bureaucracies. This assignment would also require that the Center be charged with promoting the integration of the numerous data collection activities conducted by other federal agencies (Department of Agriculture, Bureau of the Census, Department of Labor, et al.) and related private agencies (National Education Association, American Council on

> Education, and the testing industry) to minimize burden on respondents and to develop increased standardization of terminology.
>
> "The coordination role would include: 1) first and foremost, the coordination of the various activities currently under development in NCES (e.g., CCD, VEDS, NELS-88); 2) expansion of the system to include those other data collection activities of the Department of Education (e.g., Special Education, Chapter I of ECIA, Chapter II of the Math and Science Act); and finally, 3) establishment of out-reach activities to other agencies to ensure appropriate federal and national coordination. Included in this function would be defining a common set of data elements across the spectrum, coordinating collection of all statistical data, developing efficient collection and dissemination systems (in conjunction with users and providers), seeking out current needs for educational information, and providing assistance, both technical and financial, to the respondees and users of educational data.
>
> "Any effort at a ten-year plan, without a clear understanding of the agency's mission and philosophy, offers little promise of success. Additionally, in our view, the failure to expand the mission and functional boundaries of the National Center to a true center for education statistics limits the potential growth to little more than that capacity which exists today."

Obviously, expansion of the NCES mission to that of a "true" statistical center would require commensurate expansion of capability to support such activity. Realistic investments in personnel, facilities, equipment, and funding would have to be made. Assumptions concerning the willingness of the federal government to provide needed resources were discussed in the preceding section.

In sum, the mission we envision for a federal education data center would embody the following goals:

(1) Coordination of all collection, analysis and reporting of data on education by the executive branch of the federal government;

(2) To the degree possible, collection of data on education required by all other agencies of the executive branch of the federal government;

(3) Meeting the needs of all federal policy-makers for information on the condition and status of education in the United States, by developing and maintaining an integrated national educational information system;

(4) Providing leadership and assistance to state governments and local education agencies in the development of complementary educational information systems for purposes of management and policy analysis;

(5) Effecting such research, quality control and auditing procedures as are necessary to ensure the precision, quality, and integrity of the information provided by a national educational information system.

Chapter 4

Designing a New National Educational Information System

In designing a new data system, one needs to answer several critical questions. These include:

1. What information should be collected?

This question addresses not only the "contents" of individual information elements, but also their form, i.e., fundamental linkages between elements that allow or prohibit their use for specific purposes.

2. How should the information be collected?

This issue encompasses not only the methods of data collection, but also the categories of persons and administrative records which will provide the data. Sample design, timing of collection, and provision of standards of data quality--including mechanisms for assessment and control--are also key issues.

3. How should it be made available for use?

This latter question breaks down to: Who should receive what information, in what form, when, and at what cost?

These issues address data transmission processes among those responsible for collecting the data and maintaining the system as well as information flows linking external users into the system. As such they include specification of records to be transmitted, timing and frequency of transmission, aggregations and analyses to be performed and reported, regulation of access--including timing of data releases, provision of privacy and security constraints, availability of micro- versus aggregate records, the costs of access and who should bear them.

From our perspective, an educational information system must be designed to fulfill the needs of those who will use the information to enhance the quality of the education experiences for which they have authority and responsibility. The fact that parents have such authority and responsibility implies that their information needs must be served within the information system. The fact that citizens and public officials have such authority and responsibility implies that their needs must also be served by that system. And the fact that educators have such authority and responsibility as their central concerns implies that their needs must be better met than they are currently.

By addressing whose needs must be served we also inform the issue of what kinds of information they should receive. If the information is to serve the needs of those who have the responsibility for decisions affecting the quality of education experienced by pupils, then it must allow assessment of the quality of the educational system and the parts of that system which affect its quality. Thus, only if we have a conceptual framework for the assessment of educational quality can we make appropriate choices about the information to collect and the form in which to make it available.

Such a framework should also lead to a more cohesive system, i.e., an information system which allows relevant linkages between its components so that better assessments can be made of the effects of changing one part of the system on the other parts. Also, since any information system requires allocation of limited resources, a conceptual framework allows one to set priorities within the system to achieve maximum benefit from the resources available.

A. A Conceptual Framework for Describing an Educational System.

An educational system is an organization which converts resources into educational services for pupils. From our perspective, one can specify public education as a system at the level of class, school, district, or state. These form a nested set of educational systems, with varying and changing responsibilities for governance and policy formation. Private educational systems typically have fewer organizational levels.

Ultimately, the success of an educational system--regardless of organizational level--is predicated on its outcomes. As a society, we intend the system to help prepare individuals for work, for political participation, and for family life. To the extent that education does not play its role in preparing students effectively, we desire to improve it. Because of the central role of outcomes in evaluating the success of our educational systems, greatly increased efforts have been made recently to improve the amount and character of information about pupils' achievements. The intent of these changes--at local, state, and national levels--has been to assess the quality of our educational systems and to bring about improvements in them.

An exclusive focus on achievement, however primary as a public signal of the failures and successes of a school system, is not sufficiently informative to improve that system. If excellence of quality of education is equated solely with high achievement, then we will reward and support ineffective schools. Quality of education is not merely quality of outcome, i.e., high achievement. Learning, and its educational manifestation--achievement, occur in and are supported by other parts of the pupil's life than schooling. Thus, creating an adequate national educational information system requires a more comprehensive definition of educational quality and a more systematic framework for describing an educational system.

Children live in widely differing circumstances. Some belong to families where parents value and are able to support school learnings, providing time and other resources to supplement the school's efforts, and ordering and organizing the children's lives to facilitate their achievements. Other parents neither realize the ultimate importance of these learnings, nor have they been able, in terms of their resources or skills, to undergird or augment their children's schooling. Thus, schools are confronted with wide variations in the educative difficulties they face.

Assessing and improving quality of education requires considering student achievement in relation to these difficulties, and evaluating and modifying the educational efforts which are made through the process of schooling. To merely focus on achievement means to praise those educational units that draw students from educationally advantaged backgrounds, i.e., schools and districts of high socio-economic levels; this is a disservice to those who educate disadvantaged students. If we are to improve the quality of education, we need to assess students' educative difficulties and search for and detect educative processes which lead to the highest achievements desired and possible.

A conceptual model. In order to apprehend educative processes, we must rely upon a conceptual model. This model may be simple or complex and it may be implicit or explicit, but its existence is a prerequisite to any understanding of the effectiveness and quality of schooling. Our conceptual framework--presented below--for describing an educational system focuses on the school because it is at the level of the school that educational activities take place and that pupils participate in them.

By this primary focus we do not mean to imply that all primary educational decisions and actions do take place or should take place at the level of the school. Centrally important decisions about resources and their allocations, educational goals, and educational activities and programs take place at the state level--in governors' offices, legislatures, state departments of education--and at the district level as well. We do mean to imply, however, that once these decisions are made and contraints are imposed, much of the process of implementation--i.e., using the allocated resources to create educational experiences addressing desired outcomes--takes place at the school. Thus any framework for constructing a comprehensive description of educational systems must begin with the school and expand from it to the other levels of the systems.

Fundamentally, schools and the communities they serve differ in several important ways:

•Family and Community Environment:

The families and communities served by different schools differ in significant ways. The differ in the resources available in the homes of the pupils for support of their schooling and they differ in types and levels of aspirations parents have for their children. The family composition of the community affects the attitudes, values, and goals of a pupil's peers. All of these form the context within which schools can educate their pupils.

Educative Difficulty:

Schools are faced with differences in levels and types of educative difficulties with which their pupils present them. Some present handicaps or limited proficiencies in English. Others come with limited levels of prior learning. Thus, pupils who enroll in some schools enter with cognitive accomplishments and capabilities, motivations, and out-of-school environments and resources which make educative efforts easier and less complex than those in other schools.

•Resources:

Schools have available to them different levels of monetary resources and different amounts and kinds of non-monetary resources, such as volunteer time, donated supplies and equipment.

These resources are exchanged, allocated, and configured as a teaching staff, facilities, educational materials.

•Goals:

Schools aspire to distinctive goals. For example, some public secondary schools design their entire curriculum around post-secondary career paths which primarily begin in selective colleges and universities, while other schools, e.g., "vocational" ones, may focus their whole program around immediate job entry to skilled and semi-skilled occupations.

•Process:

Schools offer educative experiences for which they require or encourage pupils' participation. These include work experience, homework, and extra-curricular activities as well as in-class experiences. Schools also structure these experiences with different standards. These standards influence the pursuit of goals with different expectations for performance, differing time allowances for accomplishment, and differing criteria for selection into subsequent experiences.

Schools also differ in the types and amounts of participation of their pupils in these educative experiences as well as in the range of experiences made available. These variations include differences in selection, participation, and completion of educational programs, course work, and homework as well as differential school attendence.

•Outcomes:

All through the schooling process, to the conclusion of secondary schooling and beyond, schools differ greatly in the goal-relevant accomplishments and achievement of their pupils. These include cognitive capabilities, credentials, and career and life paths generally.

To understand schooling in ways that carry meaning for those who participate in it and are concerned about it and its consequences, none of these areas of distinctiveness can be neglected. School outcomes may differ by intent as well as by the efficacy of programs and activities. Schools, school districts, and entire school systems are presented with considerable variations in the levels of preparation, handicaps, and other educative difficulties that their pupils bring to the schooling process and these have profund consequences for outcomes. And schools and the larger systems within which they are embedded really do differ in their effectiveness. Thus it is vital

- to describe, against a coherent conceptual frame, each of these differences in a cohesive fashion, as well as
- to attempt to sort out the reasons for differential outcomes against the structure of their origins.

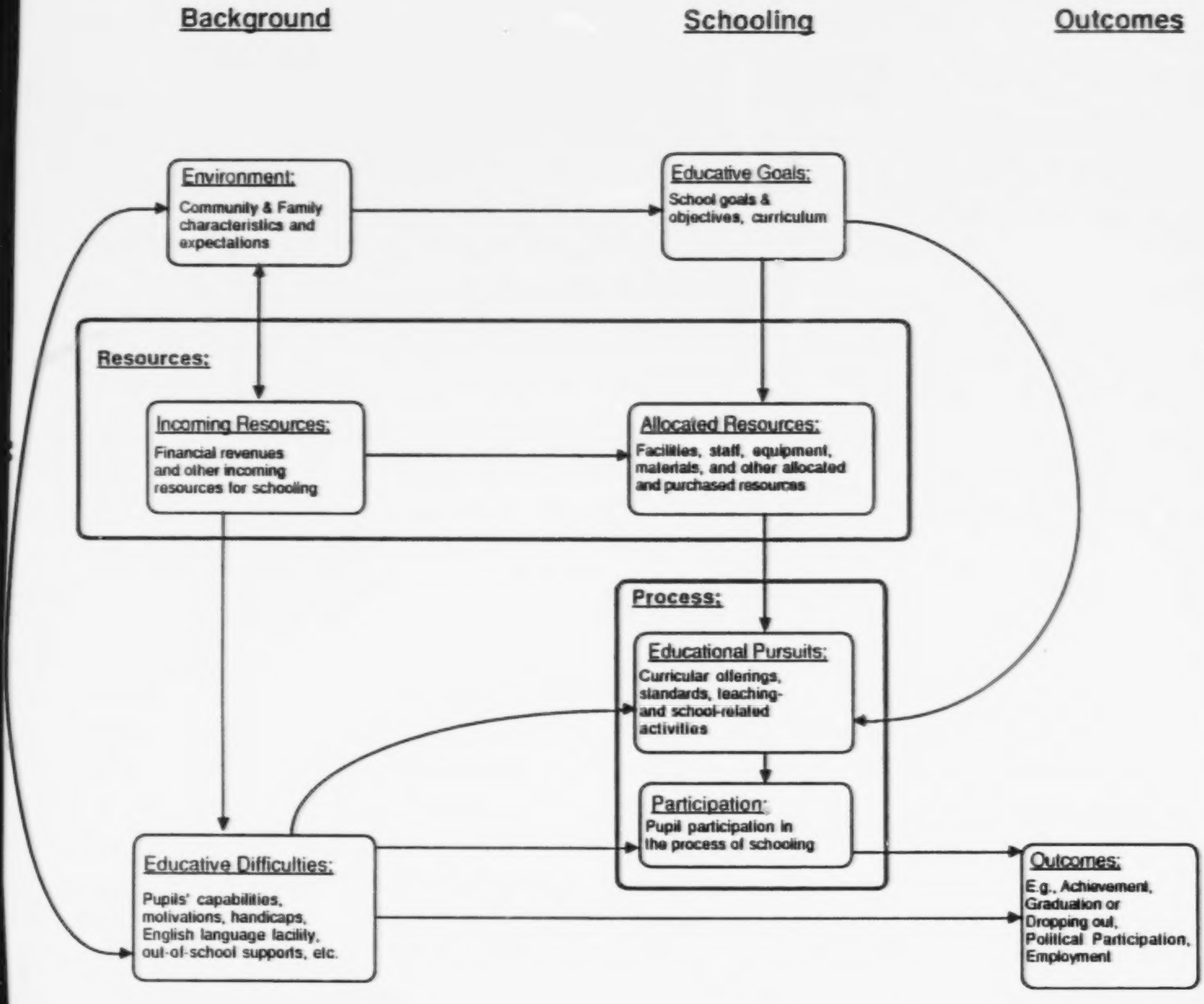
Figure 1 displays such a conceptual framework. It focuses on the schooling process, distinguishing teaching activities from pupils' exposure and participation in the resulting educative activities. And it traces these aspects of the process to their origins: prior and contemporaneous characteristics of pupils, community and family expectations, curricular goals, and resources, as well as linking them to their consequences.

The intent of this figure is to clarify that educative difficulties and goals must be accounted in order to assess the quality of a school system or an individual school. Since some schools must exert greater and more costly efforts in increasing pupil participation than others, the factors which influence the degree of effort required must be accounted if that effort and the resulting "quality" of the educative process are to be adequately diagnosed. Similarly, the desired outcomes or goals of the educational system affect the kinds of educational experiences offered pupils. Thus, schools which focus solely on narrow or atypical goals may produce learning outcomes which either advance tested achievements relative to non-tested ones or seriously skew them. Much of this effect will depend on whether the test content is broadly defined, balanced, and clearly articulated to legitimate educational goals.

What is a good school system? Within the context of school quality assessment and its bearing on school improvement, this framework treats goals, educative difficulties, and resources as pre-conditions (or background elements) for process description and outcome interpretations. We may then explore the implications of this framework for meaningful and valid comparisons of schools and school systems.

As we outlined above, educational systems are faced with difficulties in educating their pupils and these difficulties vary greatly in type and degree. Additionally, they have distinctive goals for their pupils and these goals are related to the characteristics of the pupils which they serve. In order to compare systems with respect to the quality of the education they provide, it is

Figure 1. A Conceptual Frame for the Schooling Proces


Background
Schooling
Outcomes
Environment:
Community & Family characteristics and expectations
Educative Goals:
School goals & objectives, curriculum
Resources:
Incoming Resources:
Financial revenues and other incoming resources for schooling
Allocated Resources:
Facilities, staff, equipment, materials, and other allocated and purchased resources
Process:
Educational Pursuits:
Curricular offerings, standards, teaching- and school-related activities
Participation:
Pupil participation in the process of schooling
Educative Difficulties:
Pupils' capabilities, motivations, handicaps, English language facility, out-of-school supports, etc.
Outcomes:
E.g., Achievement, Graduation or Dropping out, Political Participation, Employment

extremely important to account both the educative difficulties of their students and the goals the schools have for them, i.e., variations in type of educational program are strongly conditioned by the prerequisites of the pupils served and the goals which the schools wish to attain for these pupils. Goal variation becomes increasingly important in the later stages of the schooling process. Thus, secondary schools respond with distinctive track selection ratios, programs, and course offerings to satisfy community and family expectations. Elementary schools, on the other hand, have much more commonality in goals, at least within fundamental or "basic" educational skill areas. Thus, in the earlier stages of schooling, the primary problem is accounting for the educative difficulties schools face rather than focusing strongly on differences in aspired outcomes.

Resources are, of course, mandatory to mount any educational program. And although the resource levels needed to mount programs of adequacy or quality are widely debated, the fact that level of resources influences educational effectiveness is not at issue. Resources are used to mount the educational process, in order to attain the goals while dealing with the difficulties. Clearly, given the same goals and the same difficulties, organizations with different resource levels are not able to offer the same experiences.

How is school effectiveness and quality of schooling revealed in the achievement of pupils? Quality of schooling resides in the process of schooling. Schools differ in the educative experiences they provide and in their success in gaining pupils' participation in them. These experiences are the services that a school provides to pupils and their parents. A good school is one which provides effective learning experiences or services actually leading to set goals and which accomplishes pupil participation in those educational activities. The quality of these educational activities in which pupils participate is then reflected in pupils' achievements. But the knowledge and skill a pupil starts with will limit the outcomes of even the most effective schooling. And pupils who do not bring to school attentiveness, perserverence, and capacities to rapidly digest the instruction they receive will gain less from any school experience than those who do bring them. Thus, two educational systems with similar goals, but different achievement levels can only be assumed to differ in quality if they also face similar educative difficulties with their pupils.

What are the implications of this framework for the design of a new national educational information system? First--and foremost--in order to validly assess the quality of our educational systems, the data collected must be comprehensive. That is, these data must measure the background conditions and the current difficulties pupils present to their schools, and they must assess the goals pursued by the schools and the resources available to address them. They must record the experiences mounted--i.e., the educational services offered to and required of pupils--with these resources and they must account pupils' participation in these experiences and the outcomes resulting.

Second, in order to help improve the quality of education received by pupils, the linkages among these aspects of schooling must be revealed. For example, we need better information about how resources are used to mount educational experiences, i.e., what are the abilities and expertises of the teachers who conduct these experiences? What are they paid? How are educational activities and experiences created out of facilities, materials, and the time and effort of educators? We also need better information on participation. How are pupils with differing backgrounds and characteristics selected for participation in particular experiences? What are the actual rates of participation of various types of pupils in these experiences? Finally, we need clues to the effectiveness of tracks, programs, and experiences--especially for pupils with differing characteristics. What are the outcomes--in both the short- and long-runs--of these pupils' participations?

B. Needs and Issues Addressed by an Integrated Information System: Some Examples

The current national data system in elementary and secondary education--as we discussed in Chapter 3 above--is piecemeal and fragmented. We have very little information about the family backgrounds and educative difficulties and characteristics of pupils and the little we have is collected sporadically and exists in data sets which are rarely linked to resources, participation, and outcomes. We have basic information on revenues, expenditures by accounting category, and educational personnel. But these data are not linked together in ways which allow the tracing of resources flows. Outcome data are extensive in some data bases (e.g., the National Assessment of Educational Progress and state assessment programs), but these data are not linked to data about program offerings or participation in any cohesive fashion. Participation data (e.g., from the National Education Longitudinal Studies, or the Survey of Income and Program Participation) are not effectively linked to institutional data on expeditures or personnel.

The virtue of an integrated national educational information system built around a comprehensive conceptual framework lies in guaranteeing that the central priorities for data are met. This framework helps deliniate the data content to be included and the setting of priorities concerning that content. However, some of the most important aspects of a new data system relate to its ability to address the new needs discussed in Chapter 2. These needs primarily relate to using a new information system to address service delivery, and the linkage of delivered sevices to resources, pupils, and outcomes. From this perspective it becomes clear that the linkages between data elements are just as important as the existence of particular elements and the degree to which they comprehensively and validly represent a particular aspect of the educational system. In the examples below, we illustrate some of these linkage issues.

Quality and effectiveness of educational systems. Above we made the point that achievement, although central to the assessment of educational quality is not sufficient. First, one cannot adequately evaluate achievement as an index of effectiveness without knowing to which goals the system is directed. It is the discrepancy between desired outcomes--goals--and actual outcomes which diagnoses the effectiveness of the system. To the extent that systems are directed to different goals or have different distributions of planned outcomes, they cannot be validly evaluated without knowledge of their goals. In addition, even such holistic evaluations of quality must take into account the educative difficulties which the system faces. For example, schools, districts, and even state educational systems serve pupils of widely varying linguistic backgrounds, parental supports and resources. These discrepancies will lead to different outcomes even when system goals and resources are similar. This implies that goals, pupil characteristics--backgrounds, difficulties--and resources must be linked to each other and to outcomes in order to assess quality and effectiveness.

Also, if we are to probe quality and effectiveness so as to give guidance for change, these linkages must also be made at the microl evel, i.e., the record structure must allow resources to be linked to personnel, personnel to be linked to services, and services to be linked to pupils and their achievements.

Resource flows. One of the central data needs not currently met by the existing data system is resource flow information. The fragmented data collection system produces information on revenue sources, expenditure categories, and personnel, but these information components are not linked in such a way that one can tell which monies are spent on what. A part of the "problem" is in the fund accounting system of most school districts. However, the major issue resides in the lack of linkage between the accounting categories used for expenditure reporting and their (lack of) articulation with personnel categories reported. A system must be designed to allow micro linkages of accounting system expenditures to personnel records and employee characteristics. Additionally, these records and characteristics must be linked to the experiences and services offered in the district and (ultimately, see below) to pupils.

Pupil participation The fundamental requirement for assessing both the equity and effectiveness of educational programs is information on who participates. Equity, at its root, has to do with social and legal determinations of the amounts of resources and the kinds of programs with should be mounted for particular categories of pupils to meet their needs and to fulfill society's responsibilities to them. The data problem is made more difficult by the fact that educational agencies mount quite different programs, requiring different amounts of resources, and resulting in differential participation, by pupils of different types. Fundamentally, one would like to know

- the quantity of resources and the characteristics of programs and experiences participated in by various kinds of pupils; and
- the outcomes of pupil participation by both pupil and program or service characteristics.

These kinds of relationships require linkages of service characterisics with pupil characteristics via participation information. These linkages, in turn, require microdata on individuals.

Productivity and efficiency. Quality and effectiveness are not the same as productivity or efficiency. The former terms refer to outcomes of a system in relation to its goals and the difficulties it faces. Productivity and efficiency relate quality and effectiveness to the resources used to mount educational efforts. To the extent that one educational system is of the same quality or effectiveness as another, but has used fewer resources to accomplish this, it is more productive or efficient. Thus, to evaluate productivity or efficiency one needs to link resource information to outcomes, via goals, difficulties, services and participation. In this sense, the micro record structure and data collection needed to support analyses of educational productivity and efficiency are the most stringent of all. They require information on all three of the above topics: quality and effectiveness, resource flows, and pupil participation.

C. Some Benefits of a New National Educational Information System.

The consumers of information about educational systems include parents concerned about the education of their children, citizens worried about the quality and efficiency of the education their tax dollars finance, professional educators making decisions about programs and pupils, and public officials desiring to design laws, requirements, and resource allocations which will effectively improve education. All of these consumers are concerned that the information which reaches them be relevant and useful to their needs, timely, and accurate.

Common to all of the consumers are concerns about quality and effectiveness. It is this information which is most desired in the public debate over education. Parents want to know about the quality of education their children receive and about the qualities of the educational alternatives available to them. Citizens and public officials wish valid assessments of efficiency to know that resource allocations are wisely made and carried through desired outcomes.

Resource flows are important information for public officials in making determinations of how much and how to allocate resources. Federal officials have special concern for how federal resources are channeled to pupils and the impact of these resources on pupils with specific characteristics. State officials, in fulfilling their responsibilities, have been modifying state educational systems in ways that require comprehensive information about participation in programs, courses, and other services, standards of performance and actual outcomes. Local officials are newly concerned that they are effectively monitoring service delivery, participation and achievement.

An effectively integrated system--incorporating the microdata and records necessary to produce these new types of information--is needed by all concerned parties. The benefits of a cohesive system of this type producing national and state comparable data would be far reaching. Not only would the majority of consumers of educational information be provided with relevant, integrated, timely, and accurate information at these two levels, but the establishment of such a system would produce similar changes in district-level information systems. This, in turn, would increase the comprehensiveness and comparability of the information about education taking place in local communities. Thus, the national information system, as it is established at state and national levels will introduce cohesion in the total system.

Part II. The Design and Implementation of a New National Data System

Chapter 5
Alternative Designs for A National Educational Information System

A. Introduction

What is a National Eductional Information System? In the previous chapter, we discussed at length the need for an integrated national educatiional information system built around a comprehensive conceptual model of the schooling process. In the development of such a system, three questions need to be addressed. What sort of data base is called for? What processes will be used to get information into the data base? What processes will be used to get information out of the data base? In this Part of Chapter V, we offer general answers to these three questions and, thereby, describe in broad terms our view of what a National Educational Information System must be.

The Data Base. In order to meet the information needs of the broad array of local, state, and national educational decision makers identified in previous chapters, the data base must be structured to provide information on all aspects of the schooling process as described in our conceptual model. This means that the data base must be comprehensive; put simply, it must be adequate in scope and coverage; it must contain accurate, appropriate, and timely information on (1) the school setting, (2) the schooling process itself, and (3) the outcomes of schooling.

Data on the school setting must include information on the environmental factors that impinge on the school, such as community and family characteristics and expectations. School setting data also must provide information on financial revenues as well as other incoming non-monetary resources available to the school. The data base also must include information on the educative difficulties which face the school, such as pupils' capabilities, motivations, handicaps, English language facility, and out-of-school supports.

Data on the schooling process must include a broad range of information. The data base must provide information on the educative goals of the school, its objectives, and curriculum. It must provide information on allocated resources--facilities, staff, equipment, materials, and other non-monetary resources made available for school use. It must provide information on educational pursuits, that is, curricular offerings, standards, teaching-and school-related activities. Equally important, the data base must provide information on the extent of pupil and parent participation in the process of schooling.

Finally, the data base for a national educational information system must include information on the outcomes of schooling, incuding pupil achievement data as well as information on such outcomes as high school graduation, drop-outs, political participation, employment, and post-secondary matriculation

A second major requirement of the data base, in addition to being comprehensive, is that it be integrated, that is, that its data elements, files, and records be linked to one another. The user must be able to ask and have answered questions about the relationships among background characteristics, the schooling process itself, and the outcomes of the process. The data base must be able to provide information to answer such questions as, "What dollars buy what services for which students with what results?" Or, "What programs staffed by what types of teachers are effective for pupils with particular educative difficulties at what costs?" Only if the data base is so structured as to allow relevant linkages among its elements, files, and records will the requirement for an integrated educational information system be met.

Getting information into the data base. The dual requirements for a comprehensive and an integrated system demand, in turn, that data be collected in micro record form, as opposed to macro-record or aggregated form. We define a micro record as a datum on an individual person or entity rather than a datum on a collection or aggregate of individual persons or entities. A micro record can be dealt with as an individual datum or aggregated; for example, individual micro records on pupils can be aggregated to the school level. A macro-record, on the other hand, generally cannot be disaggregated. More importantly, the micro record permits of linkages with other micro records; for example, micro records on individual pupils can be linked with micro records on individual pupils can be linked with micro records on individual teachers and, in turn, with micro records on specific curricular offerings in which the teachers and pupils are participating. The micro record format, through its linkage capability, permits the information user to ask questions about relationships among the sets that make up the data base. Thus, the major requirement to be met in designing a process for getting information into the data base we have described above is that data be collected and stored in micro record format.

Getting information out of the data base. In the previous two sections, we identified the major requirements that must be met in establishing the data base and in getting information into the data base. A third question remains, namely, what processes will be used for getting information out of the data base?

First, a national educational information system must be able to deliver information of a comprehensive and integrated nature on the schooling process in the Nation as a whole, that is it must be capable of delivering information that is nationally representative. It must be able to report on the status and progress of elementary and secondary schooling in the United States. It also must be able to deliver information on sub-national or regional populations. In addition, we have taken as a given that the system must be capable of producing information that can be used to compare the condition and progress of education in the various states; in short, the system also must be capable of delivering information that is representative of each of the fifty states.

While such a requirement dictates attention to how information gets into the data base, e.g., the sampling designs which will be employed, also dictates--along with the previously identified requirements of comprehensiveness, integration, and micro record formats--what types of reports must be available to users of the system. Users, with the possible exception of researchers, generally will not be interested in micro records per se but rather reports developed from the processing--e.g., tabulation, aggregation, and analyses--of micro records. Thus, while micro records represent the form in which information flows into the data base, reports based on processing of the micro records generally represent the form in which information flows out of the data base. Yet, a simple proliferation of reports will not meet the needs of the broad array of local, state, and national decision makers which we have identified in previous chapters. A national educational information system must be capable of carefully tailoring its reporting formats and mechanisms if it is to serve the particular needs of this broad array of decision makers. Certain decision makers, for example governors, have needs for only certain kinds of information and not for other kinds; the system must be capable of meeting these needs. In short, the system must be capable of screening and matching its reporting formats with the needs of particular users. In addition to questions of content, the screening and matching require attention to establishing the mechanisms necessary to actually get the reports to decision makers and decision makers to the reports, and in the case of researchers, to the relevant portions of the data base itself.

Finally, the process for getting information out of the system has to pay serious attention to timing. Unless the information is available when needed, the content and form of the reporting mechanism makes little difference. Timing involves setting priorities for reporting different sets of information to different users, as well as priorities for providing different users access to different sets of information. In summary, a national educational information system must be capable of delivering periodic and differentiated reports on the status and progress of schooling to a broad array of local, state, and national decision makers, as well as making available to different users, including researchers, special reports on and public use samples relevant to particular aspects of elementary and secondary schooling in the United States and in the several states.

By what criteria should we judge national educational information system? In Part 1 above, we described in broad terms our views of what a national educational information system must be. In our description, we identified a number of requirements that such a system must meet. In this part, we briefly reiterate those requirements, as well as certain additional requirements, and identify them as the basic criteria that we believe should be used in judging any system, present or future, that purports to be a national educational information system. Our basic criteria are as follows:

1. COMPREHENSIVENESS--the system must have a data base capable of providing information on all pertinent aspects of elementary and secondary schooling including the school setting, the schooling process itself, and the outcomes of schooling.

2. INTEGRATION-- the elements, files, and records in the data base must be linked; all data sets must be capable of being related to one another.

3. micro record FORMAT--all data must be collected and stored in micro record format, with a micro record being defined as a datum on an individual person or an individual entity.

4. REPRESENTATIVENESS-- in addition to being nationally representative, the information in the data base must be representive of each of the fifty states, as well as representative of other important variables such as sex, racial-ethnic composition, urbanization, and so on.

5. ACCURACY--all data must be verifiably accurate ; they must be subjected to rigorous quality control procedures including audits, reinterviews as a routine part of data collection, controls on data entry and data processing, consistency and completeness edits, and regular and routine calculation of measures of variance.

6. COMPARABILITY--data from different jurisdictions must reflect the same concepts and definitions; common units of reporting and common definitions are necessary precursors of useful data aggregations.

7. TIMELINESS--in general, data must be limited to that which can be collected, stored, and analyzed within three months and reported to policy makers within the year.

8. PRIVACY AND SECURITY-- because some of the elements, records, and files contain information about individuals, e.g., personal identifiers necessary for longitudinal studies, strict confidentiality and security measures must be in force.

9. PROCESSING AND ANALYSIS--a specific schema must be available for processing the micro records in a manner designed to optimize the analytic capacity of the system.

10. INFORMATION FLOWS--the system must be capable of screening and matching its reports to meet the particular needs of particular users; a wide array of reporting formats and access mechanisms must be available to serve the different users; specific priorities must be set for meeting the different timelines imposed by the needs of different users.

11. COSTS OF TRANSMISSION/ACCESS-- a pattern of shared user costs should characterize the system; rather than rely exclusively on federal support for transmitting information to users and/or providing them access to information, a national educational data system should also draw support from a program of user fees and thereby increase its capacity to serve the differing needs of its users; equally important, transmission/access modes should incorporate the latest developments in electronic communications technology.

How does the existing system stand up against these criteria? In this section, we assess current NCES data-collection activities against the criteria identified above. In Chapter 2, we discussed these activities at some length, describing them as an unarticulated set of projects rather than as a program or system for providing information on the elementary and secondary schools of the nation. As such, they fail to meet the criterion of INTEGRATION. They exist as a discrete set of activities. In their present forms, it would be extremely difficult if not impossible to merge these into an integrated system, principally because they also fail to meet a second criterion, namely, that all information in the data base be collected and stored in micro record FORMAT.

Even if it were possible (which we do not believe it is) to integrate the current activities, such a system would still fail to meet the criterion of COMPREHENSIVENESS. As we pointed out in Chapter 2, and as was amply documented by the authors of papers for the Redesign Project, current NCES data on elementary and secondary education are simply inadequate in scope and coverage. Data are lacking on substantial aspects of elementary and secondary education, for example, the type and quality of instructional activities in our nation's schools.

The present set of activities also fail to meet the fourth criterion, REPRESENTATIVENESS. Most of the data collection activities of NCES support estimates of parameters only for nationwide, or occasionally for regional populations; for the most part, data representative of each of the fifty states are not available. The ACCURACY of current NCES data is also in question. The authors of the papers for the Redesign Project provide extensive documentation regarding the inaccuracy and impreciseness of NCES data.

Nor is the criterion of COMPARABILITY met. Common units of reporting and common definitions, particularly in the case of the Common Core of Data, often fail to exist, thus producing substantial differences in the meaning of data reported by the different agencies. As we also pointed out in Chapter 2, current data-collection activities fail to meet the criterion of TIMELINESS. In several instances, the most recent data available are two, three, four, five, and even ten years old.

The one criterion of the eleven we have identified which current NCES activities apparently do meet is PRIVACY AND SECURITY. There was little or no evidence in the same 60 odd papers that undergird the synthesis report that privacy and security of current activities was a problem; most comments on privacy and security related to proposed new modes of collection, storage and dissemination.

The remaining three criteria that we have identified--PROCESSING AND ANALYSIS, INFORMATION FLOWS, and COST OF TRANSMISSION/ACCESS--are perhaps more germane to the new system we propose below. Therefore, while it is true, it may be unfair to say that the present set of NCES data-collection projects fail to meet these criteria.

Our answer, then, to the question of how the existing system stands up against the criteria which we have identified is: "NOT VERY WELL, AT ALL!" Our assessment of current NCES data-collection activities against the criteria we have identified leads us to the conclusion that TINKERING WITH THE PRESENT "SYSTEM" IS NOT THE ANSWER. WHAT IS NEEDED IS A RADICALLY IMPROVED, AND VASTLY MODIFIED, NATIONAL ELEMENTARY AND

SECONDARY EDUCATION DATA SYSTEM--ONE THAT MEETS THE ELEVEN BASIC CRITERIA WE HAVE IDENTIFIED. We turn now to a discussion and description of the approaches to building a system that, in our judgement, meets these criteria.

B. The Use of Educational Information

A conception of use. Earlier in this report, we distinguished between managerial and policy uses of information. Managerial uses of information primarily relate to ongoing decisions necessary for an organization to carry out its mission. The nature of these decisions is predicated on the established mission and specific goals of the organization, and the specific organizational structure created to carry these out. Policy decisions relate to modifications in the mission or the specific goals of the organization, and to changes in its organizational structure.

Managerial uses of information occur totally within the educational system. Policy uses occur both within and outside of the formal boundaries of the system. Managerial uses occur at both the local and the state levels. Local districts have local record systems and information flows which inform decisions of teachers, counselors, principals, central administrative staff, parents, and students. These information systems support decisions about hiring and purchasing, curriculum and instructional planning, and pupil participation in programs and activities. State educational agencies--as described above--have records on local district and school activities which support decisions about funding flows and sanctions for non-conformity with state laws and regulations.

Policy uses are not restricted to the educational system itself. Public discussion of educational issues and of system quality and performance occur at both the local and state levels. Individual citizens and interested groups participate in these discussions and much of the information flow occurs through news media. At the local level, the ultimate foci of these discussions are decisions by the governing boards. At the state level, the foci are decisions of legislatures, governors, chief state school officers and state boards of education. Much of the information informing these discussions and the decisions flowing from them comes from the information collected and recorded for the purpose of managerial decision making. Special analyses and reports are prepared from these data bases to enlighten discussion and decision. Increasingly however, these managerial data are supplemented by data collections not intended to support managerial decisions. Many states are collecting data--e.g., test performance information--which are not used for regulatory purposes but are intended solely to inform debate and policy formulation. In addition, federal micro records--from the High School and Beyond survey--have been used to produce special tabulations for policy purposes in several states. Recently, the National Assessment of Educational Progress has also allowed states to pay for sample supplementations for similar purposes.

As we have discussed earlier in this report, the federal role in this information system is singularly important. There is a longstanding federal responsibility for general reports bearing on the condition of education in the United States, and for specific data collections and analyses supporting the formulation of federal education policy.

However, the current condition of education has added to this responsibility. As we noted in Chapter I of this report, the rapid and profound changes in the structure and a participation in educational decision making stimulated by the reform movement have generated entirely new needs for the collection, analysis, and distribution of educational information. There are now strong calls for the federal component of the nation's educational statistics system to produce and disseminate entirely new kinds of information and to make this information available--on an accurate and timely basis--so that state educational systems can be validly compared and state decision makers can be provided with quality information to support productive state policy formulation.

In the rest of this subsection we will lay out a framework for the decision processes at the state and local levels and draw from this framework the nature of the data that need to be collected, analyzed, and reported to fulfill federal responsibilities to the public and to the states. We will also address the issue of how these data should be made available for use by those who must make important decisions about our educational systems.

Schooling decision processes. In our conceptual frame for the schooling process (Chapter 4), we set forth schema for characterizing schooling, together with its preconditions and its outcomes. What was not explicit in that schema were the kinds of decisions which must be made in order to carry out schooling. It is these decisions which require information. And it is this information which must be collected, organized, and distributed before it can contribute to these decisions. We will first analyze the decisions made at the local level, mentioning some of the constraints which narrow decision options. We will then look at the state policy role, exploring the nature and methods by which states influence local education decisions. This will then allow us to discuss the kinds of data needed by particular decision makers and the form that it should take. Finally, we will outline some of the policy options for information distribution.

Decision processes in local education agencies have many participants- school board members, administrators, teachers, parents and students. If we follow the schema of Figure 1 (Chapter 4), resources flow into the school, are converted to staff, facilities, equipment, and materials, which--in turn--are converted into educational pursuits. Pupils participate in these pursuits and, as a consequence, learn, accomplish, and achieve. Each stage of this conversion process-- (1) monetary to (2) human and material resources to (3) offerings and activities to (4) pupil participation--involves fundamental educational decisions. These decisions constitute the schooling process within the constraints imposed by existing policies and available resources.

To fully create the schooling process, four basic types of decisions must be made: (1) budgetary, (2) hiring/purchasing, (3) curriculum/instructional, and (4) participation . These are illustrated in Figure 2.

Budgeting decisions allocate incoming resources--primarily monetary--to budget categories. These allocations are clearly constrained by the total resources available from all sources. The decisions are made by governing boards on the basis of information and recommendations provided primarily by administrators and they incorporate the schooling goals held by the participants.

Hiring/purchasing decisions are made by administrators using the budgeted resources. The purpose of the budget is to formally constrain these decisions to follow the goals and priorities of the budget makers. Stated policies (formalized goals) guide administrators in making decisions within budgetary guidelines. Also, the availability and prices of personnel and products with particular characteristics limits these hiring and purchase decisions.

Curriculum and instructional planning take place within the limits imposed by employed personnel and the facilities, equipment, and materials purchased by the local agency. These planning decisions further implement school goals insofar as they are internalized by the personnel making them or are codified into formal policies. The planning creates educational activities--programs, courses, units, etc.--and organizes, staffs, provides facilities and materials for, and sequences them.

Participation decisions are constrained by the available offerings. If a program, course, or unit is not offered, a pupil cannot participate in it. Participation decisions are made by teachers, counselors, administrators, parents, and pupils. Many of these decisions are jointly arrived at, but all are made subject to school policies about eligibility for participation. Most of the eligibility policies have formal elements based on past or present pupil characteristics such as grades, test scores, legally structured definitions of linguistic proficiency, handicap, or prerequisite experiences.

Finally, these experiences, together with what the pupils bring to them, produce learning and achievements, which precurse the subsequent outcomes of schooling.

By using this schematic portrait of local schooling decision processes, we do not mean to imply a linear chronological and causal order. Clearly, for example, some curriculum decisions can be made before the hiring decisions necessary to implement them are made and some hiring may take place before budgets are formally approved. We do imply, however, a logical order. This logical order permits us to trace the flow of resources as they are converted into pupil experiences and thus to analyse the decisions which produce these conversions. The evidence produced at the local level to inform these decisions thus forms the local information base which can be used to create data for state and national information systems. Also, as the decision processes are constrained by policies--formulated at both the local and state levels--a conceptualization of the kinds of decisions and their interrelations helps to define both the content of potential policies and the kinds of information useful in formulating them, i.e., it provides criteria for a national educational information system.

Information to inform educational policy. We now turn to state policy making. The purpose of state educational policies is to influence the actual experiences of pupils and via these experiences to affect the learning, achievements, and subsequent life paths of these pupils. The only way in which such policies can have these effects is by influencing the decisions of local educators. These policies--state laws, regulations, formal guidelines--generally provide resources, contingent on specified events or occurences, or require or prohibit local agency actions. They may also attempt to modify the context within which decisions are made. In any case, they constrain or attempt to constrain local decisions.

In Figure 3 we exhibit some of the effects of state policies/laws on local decision making. The left part of the figure--the row headings--lists some of the decision contexts and decisions displayed in Figure 2. The column headings list some common types of state laws and policies. The entries corresponding to a paired row and column indicate whether the particular policy or law constrains a specific type of decision or modifies a decision context. Thus, for example, certification rules constrain local hiring decisions and might also affect the pool of individuals considering teaching careers. Another example, might be the effect of new graduation requirements on pupil decisions about course taking, school decisions on course offerings and teacher hiring, and budgetary allocations.

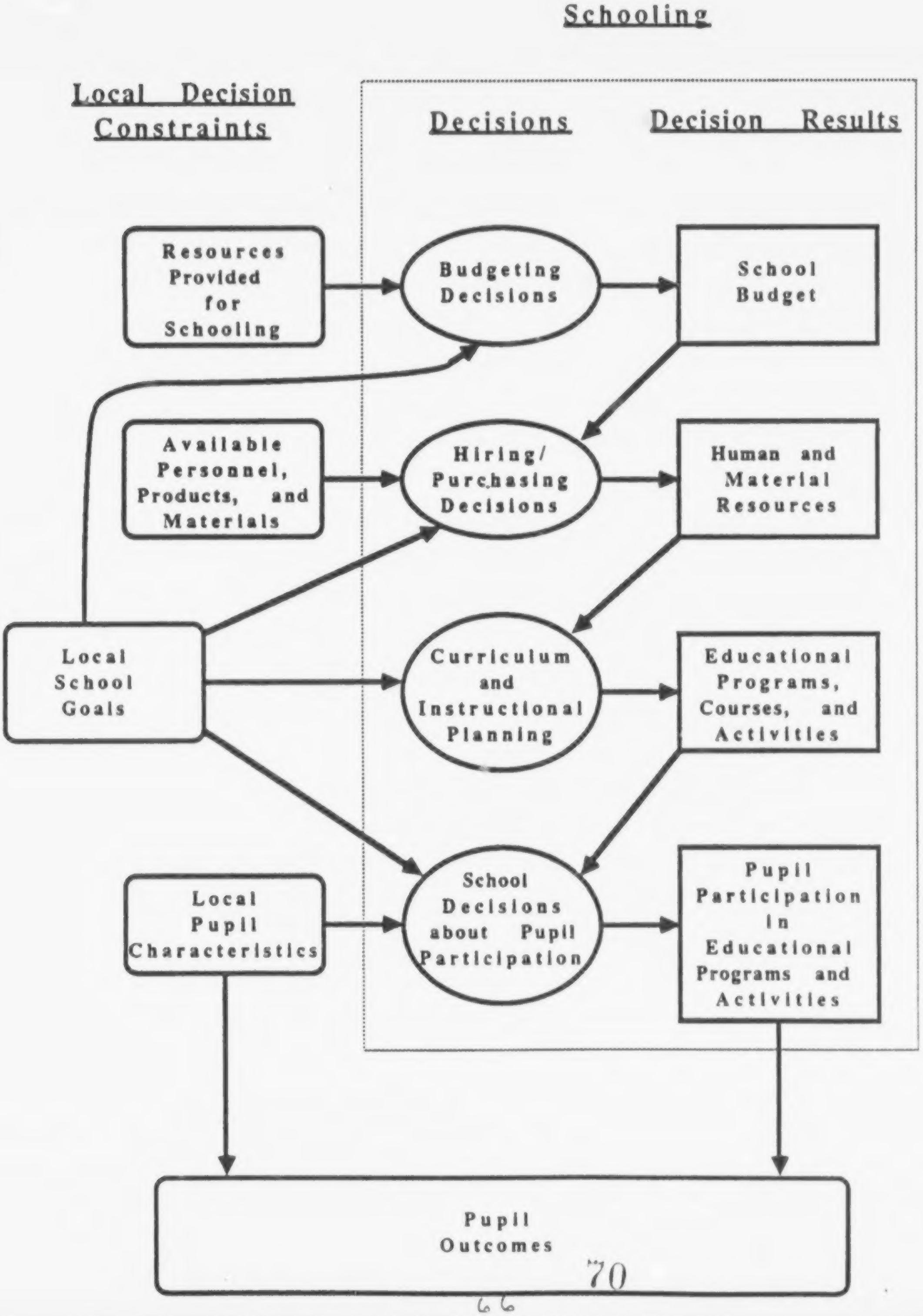
These examples also indicate some of the primary data needs of those who formulate and influence educational policy at the state level. At the minimum, information is needed which not only characterizes the outcomes of local decisions, i.e., information about the budget, about the human and material resources hired and purchased, about the educational programs and activities offered, and about participation. Information is also needed about how these outcomes were produced, i.e., how monetary resources were converted to human and material resources by expending salaries and purchasing products, how these resources produced courses, programs and activities by consuming materials and the time of educational personnel with particular skills and characteristics, and which pupils participated in which activities.

This framework focuses on two essentials: (1) the decisions made by parents, pupils, teachers, and other professional educators about the conduct of and participation in actual educational experiences; and (2) the constraints imposed by policies--state and local--on these decisions. If the policies are to be effectively formulated, the knowledge base about the decisions must be relevant, comprehensive, and accurate. This perspective forms the basis for the design of a national data base.

We note here that an information base intended for regulatory or managerial purposes overlaps

FIGURE 2

Local Resource, Program, and Pupil Decision Processes for Schooling


Schooling
Local Decision Constraints
Decisions
Decision Results
Resources Provided for Schooling
Budgeting Decisions
School Budget
Available Personnel, Products, and Materials
Hiring/ Purchasing Decisions
Human and Material Resources
Local School Goals
Curriculum and Instructional Planning
Educational Programs, Courses, and Activities
Local Pupil Characteristics
School Decisions about Pupil Participation
Pupil Participation in Educational Programs and Activities
Pupil Outcomes

Direct Effects of State Policies on Local Schooling Decision Processes

School Context or Decision	State Legislation/Policy: Legislated Schooling Purposes	School Finance	Curriculum Mandates	Special Population Programs	Certification	Assessment/ Accountability	Graduation Requirements
Decision Context							
School Goals	X		X	X	X	X	X
Resources for Schooling		X					
Available Personnel, Products and Materials					X		
Decision							
Budgetary Decisions	X	X	X	X	X		X
Hiring/Purchasing Decisions			X	X	X		X
Curriculum and Instructional Planning	X		X	X	X	X	X
Pupil Participation Decisions			X	X		X	X

FIGURE 3

but is not identical in concept to one focusing on policy. A managerial information system might be less comprehensive in content if existing state policies address only limited aspects of educational decisions. But, since state laws and regulations affect each school district, it is mandatory that equivalent information be collected for all of the state's districts if conformity to law and policy is to be monitored. Thus, policy deliberation on some topics might require more extensive information on a smaller number of educational units than management or regulation. Similarly, federal education policy relates to the same local educational processes and decisions that local and state policies address, even if the modes of impact are distinct. We believe that this implies that the conceptual framework for the information to be collected is compatible for state, local, and federal policy information as well as for state management information. The fundamental differences have more to do with information priorities rather that with the basis for specifying relevant types of information.

Thus, we believe this schema provides us with some of the necessary characteristics of a national data base that can be used to productively inform debate and decision about improving education.

C. The National Data Base

As we discussed above, a statistical information system has three aspects: a data base, processes for the collection and entry of information into the base, and processes for transforming and transmitting information out of the base. In the previous subsection, we discussed the kinds and levels of use of educational information for managerial and policy decisions. From this point we will proceed to draw on the implications of this discussion for the content and structure of the data base. Subsequently, we will explore some of the alternatives for getting this information to those who can use it for their decisions and then discuss options for data collection and data base creation.

A conception of the data base. The core of a data base is its content and organizational structure. The content of a data base consists of the definitions of the data elements included. The structure of the base consists of the records containing these elements, the files containing these records, and the linkages among them.

Data elements characterize specific entities and the elements which characterize a single such entity are often kept together. These collections are termed records. For example, pupils might be characterized by features of their home environments, the courses they have taken, or their tested achievement. Similarly, teachers could be characterized by their credentials or their employment and salary histories. Districts, schools, educational activities, and equipment could all be entities for which files are constructed. Local education agencies maintain files and records with many of these kinds of entities as the focal unit.

Thus, an accounting system is a collection of records of transactions. An employee file contains records for each employee. A district level school file contains records on each school in the district. A high school catalogue or student handbook contains "records" on each course offered. And a transcript file contains records for each pupil in the school. We term these "basic" files: micro records.

Up to this point in time, the statistical information in the Common Core of Data has not included micro records for pupils, for educational personnel, or for school programs or activities. Other data bases do include micro records. Examples are the pupil records of High School and Beyond and the National Assessment of Educational Progress. The Common Core of Data consists primarily of summary or aggregate records. Thus school districts count pupil and employee records to create enrollment figures and personnel distributions and these new summary records are further summarized by the states. Similarly, accounting transactions are summarized into ledgers and financial reports which are transferred to summary records for transmittal to state and federal data bases. Thus, for example, the school district records in the Common Core of Data contain some school district level micro data--e.g., identification number, address, fiscal and control status, type code, etc.--but the primary data contained in these records are summaries of pupil, employee, and school micro records maintained at the school or district site.

One primary recommendation of this report is that the federal data base contain micro records for pupils, personnel and material resources, and educational activities. It is not advocated that the federal collection of these micro records constitute censuses of pupils, personnel, and activities. Although, within the data collection alternatives outlined below, some states may wish to explore this option in the reconfiguration of their own management and policy information systems. Thus, the structure of the data base being proposed is an integrated collection of sampled micro records.

Such a data base structure is mandatory if the process of conversion of resources into experiences outlined in the previous subsection is to be traced. The critical policy decisions now being made at the state level are specifically intended to influence and constrain the critical decisions in this conversion chain. It is this chain of decisions which is the key to the improvement of educational quality and which constitutes the focus of the new educational reforms. Only micro records for personnel, pupils, and activities can produce the kinds of analyses and reports necessary to inform and evaluate these new policy initiatives.

For example, linkage of course taking to achievement--in the sense of tabulating the achievement test results for students with different patterns of course taking--is impossible without student micro records containing both course taking and achievement data. Separate school, district, or state aggregates of course taking and achievement do not permit such reports. Similarly, tabulation of the qualifications of the teachers who teach specific kinds of courses is impossible without integrated micro records linking teachers and their qualifications to the particular courses they teach.

File structure and content. In the rest of this section we outline the kinds of files we envision constituting the national data base. These files fall into three categories.

First, there are within-school micro records. At the minimum, we recommend that these micro records constitute a collection of such records in each of a sample of schools. An open issue is whether such collections should be censuses in some or all sampled schools. We also recommend that such records be contained in at least three linked files: pupil, personnel, and educational activity.

Second and third, there are school and district-level records. Currently, such records are maintained in the Common Core of Data. Under some of the data collection alternatives discussed later in this report, these records might consist of samples rather than censuses as at present. Also, within district micro records are necessary. At the minimum, samples of personnel records for non-school based district personnel are required for a sample of districts so that summary estimates of personnel figures do not omit personnel who are not assigned to schools. Financial records may also be collected within districts--with coverage of sampled schools--so that human and material resource files can be constructed. To keep records of managable size and acceptable accuracy, we also recommend that many of the currently collected school- and district-level aggregate counts be calculated by aggregating the within-school micro records in the central data base rather than continuing the collection of the aggregates themselves at the school- and district-site levels. This procedure would allow standardization of data definitions at the micro record level which, in turn, will assure the validity of aggregate comparisions. As we discussed earlier, a central problem for state-level comparisions currently is the lack of commonality in the definitions of particular data elements by districts and states.

1. Within-school micro records.
   a. Pupil files. These files should be extracted from the various pupil level records maintained at the school site. We envision records for pupils with the following categories of data elements:
      - (i) family background and home environment,
      - (ii) special needs and educative difficulties presented to the school,
      - (iii) educational outcomes: achievements, graduation, dropout, honors, etc.
      - (iv) educational participation: attendance, activities, pursuits, experiences, e.g., grade level, courses, program participation, etc.; these will be linked to the activity files, below.

b. Personnel files. These files will include records on the educational personnel attached to the school. They would include information on: position held, responsibilities, compensation, credentials, academic and employment history, participation in educational activities mounted by the district. These latter elements will be linked to the activity files, below.

c. Activity files. These files will include records on the educational activities mounted by the school. These activities might be defined at different levels of aggregation, e.g., Chapter 1 participation, grade level, semester-class or course, counseling services, special activity, program or course of study. The records in this file will be linked to both the personnel records of employees who participate in their provision and the pupil records of participants.

We note here that the number of data elements in each of these files could be quite modest. We estimate that the physical personnel micro record file required to reproduce the current Common Core of Data aggregates need contain no more than five data elements each.

2. School files. These files will contain records for each school in the data base. These records will include characteristics of the community served by the school as well as organizational and structural charcteristics of the school which are not aggregates of pupil, personnel, or activity records and which are not selections of district records. Examples of data elements are those currently included in the Common Core of Data, however, we envision additional information, such as information concerning the community served by the school.

3. District files. These files will contain records for each district in the data base. Data elements will include characteristics of the community served and organizational and structural characteristics of the district which are not aggregates of within-school micro records or school records. In addition, categories, sources, and amounts of in-kind and fiscal resources flowing into the district will be recorded, together with Source-Imposed constraints on their expenditure. Expenditures will also be included in three ways: district-wide amounts in expenditure categories will be recorded at a finer level of detail than currently, micro expenditure data will be collected for district-wide expenditures, and micro expenditure data will be collected for sampled schools in the district. To supplement these kinds of expenditure data, it is possible to construct parallel files on resources puchased. Thus, for example, district level personnel files can be constructed for non-school based personnel and facilities, equipment, and materials files can also be created. Again, it is important to create these files for

resources which are not school based as well as creating school-linked records from central district files. Of special importance to these latter records are equipment and educational materials.

Feasible tabulations, analyses, and reports. Two categories of analyses and reports are feasible with a data base of this kind. First, there are counts, summarizations and aggregations of data elements. Thus, enrollments, achievement test averages, course taking patterns, and home environmental characteristics are available by processing individual pupil records to the level of the school, the district, the state, and nationally. Similar summarizations are possible for educational personnel, other purchased resources, educational offerings and resource inflows. At this level of analysis, the current information in the Common Core of Data would be reproduced from the new data base. However, substantial additional information would also be available which is currently unavailable. This includes not only characterizations of pupil background, special needs and difficulties, program and course participation and achievement, but also teacher characteristics and qualifications, and characterizations of the programs, experiences, and courses offered by the school or district.

Second, the micro data files are linked. This allows relational tabulations and reports to be created. In addition to tabulations such as course-taking linked to achievement-- a cross-pupil data element tabulation referred to above--cross-file tabulations are possible. For example, teacher characteristics can be linked--via course taking-- to pupil performance. Thus, a three way tabulation could be produced from linked micro records of teacher characteristics by course type by achievement. Such tabulations would form important information for consideration of certification or graduation requirements policies.

D. Access to and Use of the Data Base.

Conceptually, in order for the information contained in a data base to be used, it must be extracted and transmitted to the person who has use for it. When more than one person has use for the information in the data base, the provisions for access can be thought of as a network of channels linking potential users to each other and to the data base. Such a network is complex and ought not to be thought of solely as the collection of channels emanating directly from the data base itself.

For example, the wide-spread use of copying machines has resulted in information flows of statistical as well as text information to and from potential users who might not have easy or inexpensive access under other circumstances. The current rapid expansion of microcomputers and telecommunications hardware and software foretells future changes of similar importance in such transmission channels. Another example of such flows is through the news media. Important information contained in statistical data bases are conveyed via agency press releases and briefings to published news reports which reach audiences with no direct contact to the data base.

Thus, channels of information flow can be thought of as being embedded in a linked network wherein users with direct access relay information to other potential users each of whom, in turn, may pass it on in edited, selected, or modified form. Each of the individual channels allows information flows which have the following characteristics:

1. a transmitter and a recipient,
2. a collection of information to be transmitted,
3. a format, and
4. a timing.

Thus, the issues to be raised in making information available for use relate to:

1. the group consisting of all transmitters and recipients,
2. the structure of the communication links among them, i.e., the network,
3. the way in which the information is modified as it flows through the network, and
4. the matching of the content, format, and timing of the information received to the users' information needs.

Issues in targeting access to information. One of the most important (and most neglected) aspects of statistical policy for statistical agencies is priorities for access to information. Part of this is lack of information on the part of the agency. Agencies typically do not have a clear conception of the actual users of the information they provide, let alone the potential users. Comprehensive statistical surveys of the use of the information they provide or the usability of such information to relevant populations of potential users are seldom undertaken. Almost all of statistical policy making in regard to access has been formed by informal perceptions of existing data constituencies.

It is time that the Center for Statistics engages in a systematic effort to map out the potential collection of users and transmitters, both nationally and at the state level. An assessment of the information transmission channels would clearly exhibit major blockages in information flow, in terms of existence of channels, and in the match of the information content and format to the users needs. The Center must create an information base on the actual and potential use of the information contained in the national data base and create an ongoing mechanism to set and maintain statistical priorities for access.

Of particular importance at the present time is the timely availability of relevant information for public discussion, policy formulation, and legislative and administrative action at the state level. With the refocusing of educational policy on state-wide educational reform, new mechanisms for the targeting, presentation, transmission, and retrieval of micro records, aggregate statistics, and analyses based on a federally maintained national data base are mandatory. And how such information is channeled to parents, interested groups, and public officials is a fundamentally new problem to which federal attention and resources must be allocated.

Existing modes of information transmission and data availability. Statistical agencies have a variety of tools for transmitting information to potential users. Our impression is that because of the lack of information and policy concerning data access, some of these modes may be currently underutilized by the Office of Educational Research and Improvement. Such access methods may be catagorized in the following manner:

a. Published information
    (i) periodic publication of basic data series: in the Center, the main current vehicle for this mode is the Digest.
    (ii) social indicators: periodic reports, topically organized, from a variety of sources; the Center's vehicle for this is the Condition of Education.
    (iii) topical reports: focused reports on single topics of public or policy interest; this mode is not commonly used by the Center.
    (iv) press releases.
b. Machine readable files
    (i) public use micro records.
    (ii) machine readable summary files.
    (iii) on-line access to data base.
c. Response to special data requests
    (i) specially-constructed, user-designed, machine-readable files, e.g., micro records, aggregate or summary files.
    (ii) user-requested--printed or microfiche--tables.
    (iii) user-specified statistical analyses.

Each of these modes of access is currently being used by at least one federal statistical agency, but several are not part of the Department of Education's access and distribution system. The following section attempts to link the users of information to potential modes of access

Goals for a system of information access and distribution. The system of information access and distribution is a central policy matter for any government agency maintaining a data base. As we discussed in Chapter 4, such a policy involves "who should receive what information, in what form, when, and at what cost." Above, we outlined how recipients (i.e., users) of information are linked together and to the data base--both by the modes of access supported by the government agency and by the secondary channels connecting the initial information recipients to others.

Thus, the tasks of the agency prerequisite to the formation of an information policy are to (a) specify and prioritize information recipients and users; (b) determine which information is most useful to priority recipients; (c) determine what form such information should take in order to be most useful; (d) determine how the utility of this information depends on the timing of its receipt, (e) assess how alternative modes of access and transmission determine which users receive what information, in which form, when.

On the basis of these determinations and assessments, the agency can then establish a policy for allocating its available resources to the variety of modes of access and transmission in the light of their likely consequences for the actual receipt of the information. A major part of this policy would be an apportionment of the costs of access between user and agency. Historically, one successful effort of the Census Bureau has been a shifting of portions of the access cost to the user. In the case of the Office of Educational Research and Improvement, major users of the information are other governmental bodies. This imposes a materially different context on the question of cost apportionment than in the case of primary use by the business community.

The most important issue we raise here is not the content of the information policy which OERI must establish. It is the necessity of actually establishing one. Until such a policy is formulated, there is no basis for designing a distribution system or allocating the agency's limited resources to the activities supporting that system.

E. Data Collection Alternatives

The proposed information system is based on three elements:

(1) A cohesive, comprehensive national data base;
(2) An information access and distribution system, and
(3) A data-collection system.

We have proposed, above,

(1) A framework for defining and organizing the data base, and
(2) A set of goals and criteria for creating a newly comprehensive system of access and information distribution.

In this section, we identify some alternatives for state participation in the collection of data for the new national data system. These alternatives have varying degrees of integration with newly-emerging systems of policy and management information at the state level. We also propose a new mechanism for cooperative engagement with state departments of education, in forming the new national information system.

We envision data collection as a joint federal-state responsibility. However, every state may not choose to participate in the same fashion. Some states may see little advantage--at least in the short run--in greatly modifying the nature and extent of the management and policy information they collect. Others may see considerable benefit in a federally-assisted revamp of their entire information system. Most states may be willing to make important changes in the definitions and modes of collection of information helpful to them in their policy and management decisions without fully integrating their systems with the new national system.

States choosing complete integration would collect the requisite information from pupils, parents, teachers, schools, and local education agencies and forward the data required for the national data base to the Federal center. At the other extreme, states may not choose to participate in the system at all. For these states, data would be secured via an integrated set of surveys that are:

(1) federally-conducted, and

(2) parallel in content, structure and timing.

Common requirements for data collection. The key characteristic of the proposed data collection system is not the manner or mode of state participation. In each state it is the form, content, and accuracy of the data collected which is central. Data must conform to the requirements of the national data base. In order to obtain--for each state--such data, some important common provisions are necessary. These include:

1. Identical microrecord data elements will be required for pupils, staff, schools, and local education agencies in each state.

2. The records will be derived from probability samples of all students, staff, schools, public and private.

3. The school samples will provide samples of local education agencies as well as sampling frames for samples of staff, students, families and communities.

4. These sample frames will also provide the source of sub-samples and super-samples for conducting other integrated surveys.

5. Regardless of the source, data will be collected under sampling and quality control rules and procedures promulgated by the Federal center.

6. Requirements for security and confidentiality will be developed jointly between the center and the states. Federal legislation may be required.

7. State and local systems will participate with the Federal center to develop a uniform core data set to be provided for each state.

8. Data collection (or capture) will be scheduled to coincide with the important milestones of the school year.

9. The periodicity of the data collection will be determined by the Federal center with the cooperation of the state systems.

A framework for state participation in the system. The level and type of state participation can follow a large number of alternatives. The choices made by each state will depend on

(a) the current information system in the state,

(b) the state's assessment of its emerging information needs, and

(c) the costs to the state of the participation alternatives.

The minimum requirement for a national educational information system is that the data from each state be comparable. This, in turn, requires that the data definitions--i.e., the specifications of each data element--be identical from state to state. Thus, if a state is to participate actively in the system, it must adopt data element definitions which conform to those specified for the national data base. If this is not done, there is no basis for national/state cooperation and the federal Center for Statistics must take on the exclusive responsibility for data collection in those states.

Assuming that common data definitions are established, states have quite distinct existing systems upon which to base cooperation. These systems--as discussed above--have

(a) managerial or regulatory components; typically school district censuses requiring transmission of data necessary to monitor conformity to laws and regulations and allocate funds.

(b) policy components; often sample surveys of outcome or process information.

Because of this, the type and extent of potential cooperation with the national information system depends on:

1. The structure and format of state data collected for policy and management purposes. Primarily, this depends on whether the state now collects--or perceives the need to collect--micro records on pupils, staff, or activities within schools. Without a current focus or perceived need to collect policy or managerial information of this type, state/ national integration of data collection cannot be extensive.
2. The commonality of state and national needs for data of particular types. If there is little overlap in the data elements desired for state policy and management decisions--on the one side--and the data elements required for the national data base--on the other--there will be little basis for a cooperative endeavor.
3. The willingness of the state to integrate its own separate data collections and collaborate on data collection activities with the Center for Statistics. To the extent that most or all state data collections could be articulated and integrated with the collection of national data--i.e., common data forms, times of collection, personnel--a common, cost-effective data collection effort (either state or federally managed) would be feasible.

In order to clarify some of the issues relating to mode and extent of national/state cooperation on data collection, we have tried to spell out some of the features at the two opposite extremes of national/state cooperation. The first--which we term Alternative A--assumes no cooperation, i.e., the Center for Statistics takes on full responsibility for data collection in a particular state. The second extreme--which we term Alternative B--assumes maximal cooperation and integration of the state information system with the new national system. We anticipate that most modes of cooperation will fall between these two extremes, at least in the initial stages of the new system.

Alternative A: federally-conducted sample surveys. Under all of the alternatives, the data records will be produced from an integrated set of parallel, consistently timed, state representative sample data collections of individuals and administrative records. Under Alternative A, this will take the form of sample surveys conducted by the Federal Education Data Center. In each state the Center would select a probability sample of schools that will provide the basis for any other samples which may be required. This could include samples of students and staff, families of students, and school districts. In addition to public schools, a probability sample of private schools would be included in the system. Therefore Alternative A provides for the content, sample design and data base organization of the new education data system. This section describes the critical data collection elements which describe the fully Federally managed system.

The sample. As noted above the samples for the new system will be state representative. The samples will, however, conform to probability design so that it will be possible to examine various organizational constructs and geographic units other than states. For example, the resulting data file could be subdivided to focus on urban schools in a particular state or group of states; predominantly minority schools may be examined; students or teachers with certain characteristics could be examined separately. The principle limiting factor would be the size of the subsample under study.

The sample design for the surveys should provide for sample rotation so that a particular school might be in the sample for only a few years. Each year a subset of the schools could rotate out of the sample and be replaced with another. Although some large or special schools may be permanently included in the sample with certainty, the number of certainty schools may be kept to a minimum. However, this rotation scheme could introduce some disturbances into the data. Biases might result when schools remain in the sample for more than one series of interviews. The Center should anticipate this possibility and develop a research program which would examine the data from each subset separately.

Questionnaires and other instruments. Under this alternative, data will be supplied directly to the Federal Data Center or its agent from the survey site. Various methods would be used to collect data. Whenever the subject matter permits, direct face to face interviews would be conducted. Other methods such as mail or telephone interviews may be used as appropriate.

The Center will develop the methods to be used for each survey and will design the collection and control instruments accordingly. This will require an extensive research and development effort along with a full program of testing. Every effort to determine the validity of responses to the collection instruments should be undertaken at this time. Response burden, cost, and timeliness must also be considered when the instruments are being designed to find the least burdensome and costly way to produce valid and timely data.

Each document will be the basis of a microrecord in the final system and as such should allow for the kind of flexibility needed to assign survey units to categories according to the Center's definitions. For example, according to The Center for Statistics' staff, at least one state does not classify an excused absence as a true absence; with the collection of summary data, this would present either a comparability problem or a problem of dual record keeping. Using a microrecord approach, the questions for a particular pupil, on the sample day, in the sample school, should ask whether the student was physically present (de facto) and if not, whether the absence was "excused" (de jure). The part of the pupil questionnaire addressing these issues might appear as follows:

Was ... (pupil) ... physically present in school today?
  [ ] Yes -- (go to next question)
  [ ] No -- (ask:)
    Was this an excused absence?
    [ ] Yes
        (Go to next question)
    [ ] No

Aggregating these two pieces of information for each pupil in the school or state education agency, the Center may sort out this relatively simple definitional problem. In addition it might be possible to develop useful information on truancy.

The data for each pupil would also include the basic characteristics of the pupil - age, sex, race, course information, grade average, test scores and other information which will provide demographic data, performance information and other information about the pupil which when aggregated will provide extensive information about all pupils. Further, the pupil information will be related to that of the pupil's teachers, his or her school, and the local education agency to provide a complete picture of the educational system. Because the development of the forms, documents, and linkages is not simple, however, an extensive research and testing program will be needed. The designer of the pupil microrecord will have perhaps dozens of such issues to confront.

Similar issues will have to be considered for the microrecords for staff, schools, communities, local education agencies, state education agencies, and any other unit of sample to be included in the new system. The Center will require a unit to develop the micro record forms, questionnaires, or schedules. That unit will have to work closely with the states (and to the extent necessary with private schools or school groups) to determine the detailed questions needed, and to examine definitional differences between different state and local systems. Although these tasks are not easy, there are many precedents within the Federal government; most of the Census Bureau's work involves the development of questionnaires to produce microrecords. Similary the Bureau of Justice Statistics, the National Center for Health Statistics and others have extensive experience in dealing with these issues. In the final analysis, standard questionnaires to produce microrecords in the hands of highly trained interviewers should substantially reduce problems of non-comparability and improve data quality in general.

Quality Control. "Garbage in garbage out" has become a cliche in the computer age; nevertheless its truth has never been disputed. It is essential that the Center develop procedures to prevent "garbage in" at each state of the process. If the new system is to be effective, quality control procedures must be introduced at the time the survey instruments are being developed. These should be rigorous pilot studies and pretests of all of the instruments and all of the procedures to be employed in the field collection.

"Hot houses" should start the process. This is a simple process in which convenient possible survey subjects are asked to respond to potential survey questions. Pilot studies are more formal and typically involve a purposive sample of potential survey respondents. The pilot should uncover more subtle types of problems with the instruments. The pretest should be designed to begin to identify measurable statistical problems with the instruments, the procedures and even the sample; validity questions should begin to be addressed at this stage. Frequently, there must be repeats of any or all of these pre-enumeration activities. Even after all of this testing has been performed and analyzed and the instruments have been put in to use, problems with the questionnaires and procedures will become evident. A constant monitoring program must be established to determine whether the instruments had an initial defect, whether there has been a measurable biasing effect of pre-enumeration or whether the "world" has changed.

Alternative A uses interviewers to collect data directly; there must be the establishment of qualification standards for new interviewers involving appropriate tests or other selection devices along with a system of initial supervisory field observations. After new interviewers have become qualified they will still continue to be observed on a systematic basis to ensure that the survey's procedures are being followed. The Center should also develop a system of regular re-interviews in which supervisory personnel will re-interview a small systematic sample of all completed work. Acceptable error levels will have to be determined. Any interviewer whose work fails re-interview may be retrained, terminated or dealt with in other ways as appropriate. The re-interview sample will also provide a basis for estimating non-sampling error.

Since data will be received directly by the Center or its agent, the Center will be responsible for all data processing, including coding, data entry, editing, weighting, and developing the data base. All of these procedures must also be subject to rigorous quality control. Samples of coded materials will be subsampled and the coding verified. Similar steps will be taken for data which are keyed or otherwise encoded.

Organizational issues. As noted above, the responsibility for data collection lies with the Center. It can opt to undertake the collection directly by acquiring field staff and data processing capability. However, the cost and development times sharply limit the practicality of this option, particularly in the short term. Several commercial contractors already possess the technical and logistical capacity to carry out this work, however Federal procurement policies make it difficult to develop the long-term relationships which would be desirable for program development and data consistency over time. An option would be to ask another Federal agency to undertake the survey series under a reimbursible agreement. Under such an agreement, the Center could build a long-term relationship which would permit the development of integrated surveys which would respond to the changing needs for education statistics. Although Hill states that "contractors can usually get better respondent cooperation than federal agencies can," the reverse has been true of those Federal agencies which are clearly identified in the public mind as statistical collection agencies. This is particularly true of the Bureau of the Census which continuously has response rates for its reimbursible surveys as high as 95%.

Even though it is likely that the Center will contract out the data processing, it should have a staff capable of preparing specifications for data processing, weighting, and any other technical procedures.

Respondent Cooperation. In order to obtain respondent cooperation and to keep the aggrevation level at a minimum, the Center will have to take several positive steps. For example, it should carefully communicate its rotation policy to the schools so that they will understand the relatively short term nature of the commitment. Moreover, the Center will have to develop a program through which at least the sample schools receive preliminary reports of the data collected for their statistical area so that they will be able to make comparisons with similar schools. It would be useful for the Center to develop a package which would show individual schools how to utilize data in their own planning and development efforts. Perhaps a subcommittee of the consortium discussed below could assist in the development of such a document. The Center must also be responsible for keeping respondents apprised of future survey visits with information about the content and the timing of each inquiry.

Alternative B: Integrated State Policy and Management Information Systems. Several states are in the process of developing integrated state-wide policy and management information systems. Some of these states may be interested in providing data to the Center through these systems. This would be particularly desirable if certain conditions are met. First a state would have to agree to provide an identical set of data elements for each school in the sample and the local education agency associated with each school. The federal data base requires an integrated set of micro records on a state-representative sample of schools. In designing a state policy and management information system, to be integrated with the national system, states may wish to explore options with respect to (1) census versus sample survey modes of data collection and (2) different levels of integration with their own systems. In any case, the states would have to agree to provide the data on a schedule which is consistent with the processing and publication schedule of the Center.

In the discussion above -- Alternative A -- we treated issues related to the design of questionnaires and other instruments and to the quality control of the data collection activities. These issues are also central to a data collection system fully integrated with the state management and policy information needs. The same thorough pilot testing and control modes are required. However, these must be developed jointly by the Federal center and the state.

Other Alternatives. Because the proposed system is to some extent modular, there could be a variety of possible state participation modes. At one extreme a state could provide all of the data required for the entire system, including test and other survey information, to the other extreme in which a state would not actively participate at all. Some states would have a census of all of the administrative record information in the system, while others would only maintain the data for the Federally defined sample, depending largely on whether the system is to be used for management information or policy information.

There would be no restrictions on any state's system as to supplementary data elements and sub-systems it may wish to develop. A state would, however, have to provide to the Center only data for the schools in a sample and only those data elements requested by the Center. While it might be easier for some states to provide a computer "dump" of all of the data in its system, it would not be appropriate for the Federal Center to hold all such data in its computer.

Interested states would ask to supply machine readable data to the Center. It would be the responsibility of the Center to determine when a state system had reached the point where its data were complete, consistent, and accurate enough to enter the system directly.

The quality control requirements of direct state data entry into the Center's statistical program would have to be rigorous. Annual audits of a random sample of schools would be part of the program; some individual schools also be included with certainty if there was any indication of previous problems with data from that school. The Center would have to retain the authority to modify or discontinue a state's direct participation if the quality control procedures indicated serious data problems.

The data currently collected in NELS, NAEP, and other surveys would also be integrated into the new national data system.

A Mechanism for Cooperative Engagement . In order to develop the detailed design for the new national data system, the Center, working through the Chief State School Officers, should establish a consortium of all states and develop an agenda for identifying specific information elements and data elements required for the system. The Center should also appoint a number of other members to the consortium, including representatives of local education agencies, academia, and other users concerned with information about the educational system. The consortium should also have a say about the method in which the data base is organized and what data, in what form would become available.

It would be foolish to believe that a body representing this large a constituency could do the detailed planning required for this effort. There would be an obvious need to develop working groups to address specific issues. For example, several states are in the process of developing state level integrated information systems; each is designed to provide the specific data needed for state purposes. In order to foster the development of compatible systems, the Center should attempt to organize a working group of the consortium consisting of states already developing such systems, along with other states interested in similar development. Since in general the systems would be integrated, it would be essential for local systems to be represented. This would facilitate the exchange of information among the states and the development of alternative models which could feed the national data base.

Although the Center would have the responsibility for staffing the consortium and establishing working groups for the various technical issues which will have to be addressed during the development of the system, the total input to the Center should more than compensate for the cost of staffing.

F. Relative Costs and Benefits of Alternative Designs

Types of data system costs. Data systems are costly and beneficial in several common ways, and in this regard, differ principally in the relative amounts, rather than the types, of their costs and benefits. Development of a new education data system will be costly, in part to the federal government, in part to state governments, and in part to local education agencies. Alternative education data systems differ not only in the absolute magnitude of their development costs, but in the distribution of these costs across levels of government. The same can be said of the costs of maintaining an education data system, once established. In this section, we describe the types of costs that must be borne in establishing and maintaining an education data system, and the ways these costs impinge on all levels of government. As will be seen, not all types of costs evidence themselves directly in dollar amounts. Some involve investments of personnel, others impose a burden on data providers, and yet others must be counted in terms of foregone opportunities.

Development costs to the federal government. In any national data system on elementary and secondary education, it is anticipated that a large portion of the dollar outlay costs of developing the system will be borne by the U. S. Department of Education. The types of development costs incurred will include those associated with specifying the content of the system, selecting modes of data collection, identifying potential providers of information, conducting needed research on methods of measuring certain variables and methods for securing certain types of information, developing and validating instruments for data collection, developing plans, mechanisms and tools for analyzing data and for reporting results, and developing procedures for data collection, processing, analysis, and reporting.

To state governments. To the extent that they choose to integrate a newly-developed national data system on elementary and secondary education with their current management information systems and other data collection activities, a portion of the costs of developing a new system would be borne by state governments. It is likely that state education agencies would incur dollar outlay costs in modifying existing state data-collection instruments, in modifying data transmission channels and procedures, in training providers of data to participate in the new system, in developing plans, mechanisms and tools for analyzing data for state purposes and for reporting results for various state purposes, and for developing administrative procedures for integrating state data systems with that of the nation, in terms of data collection, analysis, and reporting.

To local education agencies. Whether local education agencies would bear a portion of the dollar outlay costs of developing a new national education data system would depend on their states' decisions regarding integration of state management information systems with the national data system. If states choose to integrate their systems, local education agencies would be required to modify the procedures by which they collect, analyze and store information for the purpose of reporting to their state education agency. Such changes would carry certain dollar outlay costs. In addition, local education agencies might also choose to modify their management information systems so as to minimize redundancy with, and make best use of, a national data system on elementary and secondary education. With decisions of this type, local education agencies would incur the same types of dollar outlay costs enumerated above for state education agencies.

Maintenance costs and personnel requirements to the federal government. The costs of maintaining a national data system on elementary and secondary education would, regardless of system design, be shared among the federal government, state governments and local education agencies. However, the distribution of costs among these levels of government would likely vary substantially, depending on the functions to be served by the data system and its consequent design. Maintenance costs that are likely to be borne by the federal government under any design almost certainly would include the cost of collecting, processing, analyzing, and reporting educational data for purposes of informing federal education policies. The federal government would also bear the cost of maintaining and operating the national data base. It is reasonable to expect that, at a minimum, nationally-representative samples of respondents would be required to satisfy such purposes. Another type of maintenance cost likely to be borne by the federal government under all system designs would be the cost of ongoing research and development needed to improve the validity and precision of data collected through the system.

Even if most of the data collected through a national data system on elementary and secondary education were secured through contracted services, the U. S. Department of Education would have to maintain an in-house staff with sole responsibility for management of the system. Whether an integrated data system would increase federal staff requirements or reduce them, compared to the staff needed to maintain current NCES data-collection projects, is difficult to anticipate. Nonetheless, investment of federal funds alone would be insufficient to develop and maintain a new education data system. Since the utility of an integrated data system, as proposed here, would far exceed that of the entire collection of current NCES projects, it is reasonable to anticipate the need for additional personnel to satisfy the information requests of large numbers of presently unserved users.

To state governments. Regardless of data system design, state governments would likely incur some costs in supplying data needed to maintain a national education data system. To the extent that states chose to integrate their education management information systems with a national data system, or to expand the coverage of a national education data system so as to meet their own needs for education policy information, these costs would increase. In either of the latter cases, state governments would incur ongoing costs for validation of data quality, data analysis, and reporting of results. In addition, states would incur costs for training suppliers of data.

The state personnel requirements associated with a national education data system would depend almost entirely on a state's chosen level of participation in the system. If a state were content to assist the U. S. Department of Education in securing information required for federal policy purposes, the state personnel requirements of the data system would be minimal. However, if a state chose to expand the national data system so as to meet its own needs for education management information and/or policy information, the need for state personnel with responsibility for development, maintenance, and management of the integrated data system would likely be substantial.

To local education agencies. Since local education agencies would be among the principal suppliers of data under any design for a national education data system, they would certainly incur costs associated with collecting, storing, and reporting data. If local education agencies choose to modify their management information systems so as to minimize redundancy with, and make best use of, a national data system on elementary and secondary education, they would incur additional maintenance costs for collection of data, validation of data, analysis of data, and reporting of results.

Local education agencies are unlikely to incur substantial personnel costs as a result of their participation in a national education data system that is designed solely to meet federal requirements for education policy information. However, participation in an integrated system designed to meet state needs for management information as well as federal needs for policy information might require significant local agency investment in personnel with data systems experience. This would also be true if the local education agency decided to merge its own management information system with the national data system. Collection of data for management purposes implies complete coverage of the units to be managed, rather than sampling of units. An integrated education management system that was based on micro records of the sort proposed here for a national data system would very likely secure comparable data on all students enrolled within the local education agency. In a large local education agencies, requirements for personnel to maintain such system would be substantial, but might not exceed the requirements of current, fragmented NCES, local, and state data-collection projects.

Data access costs at the state level. It is reasonable to assume that state governments would incur some costs for accessing information from a national education data system that was developed and maintained by the U. S. Department of Education. The magnitude of these costs would likely vary substantially, depending on the state's contribution to the development and maintenance of the data system and the nature and form of the state's needs for information.

At the local level. If a local education agency wished to secure information from a national education data system, it too would likely incur some costs, depending on the nature and form of the information required, and the agency's contribution to the development and maintenance of the data system. The costs of access to publicly available reports and standard data tapes would, in all likelihood, be trivial. But the cost of access to data that required special analyses or the construction of special, non-standard data sets, might be considerable.

Respondent burden for local education agencies and schools. One type of non-dollar cost that varies only by degree across designs for a national education data system is the burden borne by respondents to requests for information. Providing information is time-consuming, and therefore impinges on other, and sometimes more fundamental, activities of the schools. Accurate assessment of the respondent burden imposed by a national education data system will be difficult, since a complex system that is designed to serve a multiplicity of purposes is likely to impose the greatest burden, while reducing the total burden on respondents that would be imposed by the separate, unarticulated, requests for information that presently originate at all levels of government.

For state governments. In addition to local education agencies and schools, state governments (most likely state education agencies) would, regardless of data system design, face some burden of providing data for a national education data system. Certainly, the burden attributable to the data system would increase if a state chose to meet its own needs for education policy information or management information by expanding the national data system. However, as noted above, the efficiencies realized through data system integration would likely reduce the state's total expense and time investment in the collection, processing, and analysis of data, and reporting of information on education.

Opportunity costs and associated response burden. Every data-collection activity carries opportunity costs of several kinds. Funds invested in the data system are not available for use in other projects. Personnel required to develop, maintain, and manage the data system are prevented from pursuing other goals. The good will of potential respondents is expended on the burden imposed by the data system, and alternative requests must be minimized.

Types of data system benefits. The benefits to be realized from a data system can be characterized in many ways. Most fundamental are the benefits inherent in the ready availability of pertinent, high quality data. Another route to characterization of benefits is through consideration of the uses to be made of the data supplied. For example, benefits accrue through the use of data to increase the effectiveness of policy analysis and policy formation, or to increase the effectiveness and/or efficiency of management.

The relative costs and personnel requirements of alternatives A and B. Alternatives A and B, discussed in Section 5F, are extreme options for state participation in the national data system. Here we characterize these alternatives with respect to costs and, in the section following, the benefits accruing from them.

As described above, Alternative A consists of an integrated survey of state education agencies, local education agencies, schools, teachers, students and households that will produce micro records containing linked files of information on the topics specified in Chapter 4 of this report. The survey would be developed and maintained by the U. S. Department of Education, through one or more contracts with professional survey research organizations. The survey would produce basic education statistics and education policy information required by the federal government to meet its Congressionally-mandated responsibilities to collect, analyze, and report on the status and condition of education in the United States. Ultimately, the survey would provide comparable regional and state-by-state education statistics.

Alternative B consists of a combination of data-collection activities that would be put into place in successive phases. The integrated data set described under Alternative A would be at the heart of Alternative B as well. In addition, through a cooperative project with the U. S. Department of Education, a consortium of states would develop a common data program for the principal purpose of collecting information needed to manage their education systems. These management information systems would be linked to the national data system by collecting and storing micro records on variables that complemented those collected through the national data system and, eventually, when all 50 states adopted a common management information system, state and federal needs for policy information could be accommodated through the state systems and the need for federally-operated data acquisition projects would be eliminated.

The primary costs of developing the data system proposed under Alternative A would be borne by the federal government. Although some limited information would be sought directly from state education agencies, most of the data collected under Alternative A would be collected from local education agencies or from schools and individuals within local education agencies. Therefore, state education agencies would not be required to alter their current data collection activities under Alternative A (although it would be to their distinct benefit to do so), and consequent development costs at the state level would be minimal. In contrast, a substantial portion of the costs of developing Alternative B would be borne by state governments, since current management information systems or projects designed to secure data for the purposes of education management would have to be modified. Even if the federal government provided major funding for the development of new data collection mechanisms and instruments under Alternative B, the development costs to state agencies would be far larger than those imposed by Alternative A. Systems for analysis of data for state management purposes would have to be developed or modified, as would systems for data verification, storage, management, and retrieval.

Both Alternative A and Alternative B would impose some development costs on local education agencies and the schools within them, since, in many cases, definitions of variables in a national data system would differ from those previously used by the agencies and schools. Changes in definitions would necessitate some changes in the data collected by schools and local education agencies, as well as changes in the ways some records are aggregated and stored. However, a national data system that was designed principally or exclusively to provide basic education statistics for the states and the nation, in addition to information for federal policy-making purposes (Alternative A), would impose lower development costs for local education agencies than would an alternative that included collection of data for state and/or local management of education (Alternative B).

The primary costs of maintaining the data system proposed under Alternative A also would be borne by the federal government. Since the required involvement of state education agencies would be minimal, their required dollar contribution to the maintenance of the data system would be minimal as well. In contrast, a major portion of the costs of maintaining the data system proposed under Alternative B would also be borne by state education agencies, particularly as an increasing number of state agencies adopted components of the system that were designed to provide information for management of their educational systems.

As was true of development costs, some cost of maintaining the data systems proposed under both Alternative A and Alternative B would be borne by local education agencies and the schools within them. Micro records that were consistent with the definitions imposed by the data systems would have to be compiled and maintained in these administrative units for many categories of variables.. Again, for a data system that provided basic statistics on education at the national level, in addition to satisfying relatively limited federal policy purposes (Alternative A), these costs would be lower than those associated with a data system that served the multiple purposes of federal education policy analysis, state education policy analysis, state management of education and local management of education (Alternative B).

It is reasonable to assume that the cost to local education agencies for accessing the national data system on elementary and secondary education would be virtually identical under Alternatives A and B. In either case, it is likely that the federal government would, at most, attempt to recover its expenses in meeting requests for information on education.

Clearly, Alternative B would require a far larger investment in data system personnel by state education agencies than would Alternative A. Alternative B would require an extensive staff in each state education agency with responsibility for developing and maintaining that state's education management information system, and for integrating that system with the national data system on elementary and secondary education. In some states, state agency personnel who are currently responsible for educational data systems might be able to develop, integrate, and maintain a new system, obviating the need to hire and train additional personnel.

Alternative B would also impose somewhat greater personnel costs for local education agencies and schools than would Alternative A, since, as noted above, an education management information system would require collection of data from all schools in a state, and possibly from or about all teachers and all students in a state. In contrast, data sufficient for the dual purposes of compiling basic statistics on the status and condition of education, and informing federal education policy, could be collected from representative samples of these populations, and would not require complete coverage of the local education agencies in the United States. The increased volume of data and the greater range of data to be collected under Alternative B would impose additional personnel requests in local education agencies that supplied these data.

Alternative B would also impose larger opportunity costs on state governments and local education agencies than would Alternative A. Since substantially more data would be collected from and by state education agencies and local education agencies under Alternative B (compared to the requirements of Alternative A), this option would preclude a greater range of alternative data-collection activities. In addition, a consequence of the larger capital investments required of state governments and local education agencies by Alternative B is a greater range of foregone opportunities to collect and analyze data on education by other means.

The relative benefits of Alternatives A and B . Since an integrated national survey is central to both of the data system alternatives described above, the alternatives are virtually indistinguishable on several of the benefit dimensions discussed earlier. Once fully developed and installed, the alternatives systems would be equally beneficial in terms of (1) timeliness of data -- the lag between data collection and reporting could be comparable under both alternatives, since, for purposes of reporting basic statistics and analysis of federal education policies, identical data would be collected; (2) validity of data -- in the survey core, identical data would be collected under both alternatives, leading to comparability on this dimension; (3) integratability of data -- common coding systems that would ensure the integratability of data collected on local education agencies, schools, teachers, students, and households could be used under both alternatives; and (4) accessibility of data -- presumably, identical information would emerge from the sample survey that is common to both alternatives, and identical ranges of options for accessing data collected through the system could be provided under both alternatives.

A central feature of a fully developed and installed Alternative B is its complete coverage of local education agencies and schools within all participating states. With 50-state participation, the system would provide the potential of complete coverage of local education agencies and schools throughout the nation, on variables that were essential to state education management objectives. Since data on a greater variety of variables would be collected under Alternative B, as well as data on a far larger number of administrative units, Alternative B would exceed Alternative A on many of the benefit dimensions discussed earlier. These include: (1) availability of data -- data would be collected for a larger number of variables; (2) precision of data -- either complete coverage or larger samples of units would be used under Alternative B, leading to increased estimation precision; (3) accuracy of data -- complete coverage of administrative units would eliminate inaccuracy due to inadequate sampling, and might help control other sources of inaccuracy in data; (4) disaggregability of data -- again, complete coverage of administrative units under Alternative B would ensure that data could be disaggregated to virtually any desired level; (5) representativeness of data -- complete coverage of schools and local education agencies would ensure the representativeness of data pertaining to these types of units; (6) aggregability of data -- with complete coverage of schools and local education agencies, Alternative B would ensure the aggregability of data to all higher-level administrative units and to all subpopulations for which identifying information had been collected. Since data would be collected from a sample of administrative units under Alternative A, the aggregability of data to subpopulations of interest is not certain; (7) utility of data -- by design, Alternative B would secure data for a larger variety of purposes than would Alternative A. The enhanced utility of data collected under Alternative B would thus be ensured.

G. Development and Phasing of the Data System

Transcendent development and phasing issues. Regardless of the levels of involvement of individual states, development of a new national data system on elementary and secondary education will substantially affect current data collection, analysis and reporting activities in state education agencies, in local education agencies and in the U.S. Department of Education. As noted earlier, a new data system will require dollar resources and personnel currently allocated to ongoing federal projects and will impose respondent burdens that will preclude the continuation of numerous existing federal data-collection projects and the initiation of others. Issues such as these transcend the selection of a data system design, and influence the phasing and timing of data system development and installation. The most pertinent of these issues are:

1. Preservation of essential data time series
2. Requirements for research needed to develop critical elements of the new data system
3. Provision of adequate time for data system testing and verification
4. Impact on current state and local education agency data systems
5. Cost and personnel requirements of various phases, by level of government

Preservation of essential data time series. Although this report has identified many inadequacies in the present national data system on elementary and secondary education, the Federal Center for Statistics has, nevertheless, maintained several essential data time series. Examples of such time series can be found in the Center's Publications, The Condition of Education and the Digest of Educational Statistics, and include, by way of illustration, total enrollments at all levels of education throughout the United States which have been reported since 1899-1900 (Digest of Educational Statistics, 1983-84, Table 3, p. 8). Such time series must be preserved in the new national data system.

Requirements for research needed to develop critical elements of the new data system. Most elements of the national data system we have proposed can be developed using existing survey and measurement technology. However, other elements will test the current state of the survey and measurement art and will require intensive research and development. For example, our proposed system requires micro record information on a variety of educational outcomes, including but not limited to, achievement test data. To secure such data while adequately controlling the respondent burden imposed on individual students will require the development of new, highly efficient outcome measures and new approaches to the use of matrix sampling. As a second example, our proposed system calls for timely production of policy-relevant analyses that are responsive to immediate and particular requests from the broad array of information users, including policy makers in all branches and at various levels of government, as well as the new constituencies described in detail in Chapter 1. Considerable research is needed to develop mechanisms that will enable the Federal Center to meet these immediate and particular requests for information with timely, valid, and responsive policy-relevant analyses. Research is needed in such areas as verification of the requestors' rights to data access, mechanisms for rapidly and accurately building relational analyses using data stored on the basis of distinct file structures, methods for providing users with a variety of alternative relational analyses, and methods for assessing the relative utility to policy makers of such alternative analyses.

Provision of adequate time for data system testing and verification. Because many features of the data system we have proposed are novel, extensive testing and verification of mechanisms for data collection, data aggregation and storage, and information retrieval will be required. Such testing will require a continuing commitment by the Federal Center for Statistics, and the continuing cooperation of state and local education agencies over a period of years. Such agencies must acknowledge and agree that no element of the data system will be used operationally until it has been throughly tested and its quality has been fully verified, regardless of the sense of urgency that pervades present efforts to provide information on the nation's education systems.

Impact on current state and local education data systems. The burden imposed by the new data system on state education agencies will vary depending on an individual state's level of participation. At one extreme, if a state chose to keep its own data systems completely separate from the national data system, no additional data burden would be imposed, nor would the state be required to adapt its data-element definitions to be coincident with those of the national system. At the other extreme, if a state chose to fully integrate its data systems with the national system, it would have to accept and adopt the data-element definitions used in the national system, and it would have to adopt the micro record structure that is central to the national data system. In addition, in some of the smaller states, the proposed national data system will likely collect data in a substantial proportion of the states' local education agencies. Therefore, the response burden imposed by the national data system might limit the data-collection options of the state education agencies in these states.

The impact of the national data system will be limited to those local education agencies that are included in the state-representative samples used by the system. In sampled local education agencies, the volume and density of data collection envisioned for the naitonal system will represent substantial data burden and will likely require local agencies to adapt their own data systems in several ways. For example, the local education agencies might choose to make the data element definitions they use consistent with those of the national system. Local agencies might also choose to make the structure of their data systems consistent with the micro record structure of the national system. Although such modifications would not be mandatory, they would help to minimize respondent burden and to maximize data collection efficiency. And, of course, in states that chose to integrate their data systems with the national system, these impacts would not be limited to a sample of local education agencies, but would apply to all of the states' local agencies.

Cost and and personnel requirements of various phases, by level of government. In any national data system on elementary and secondary education, a large portion of the dollar outlay and personnel costs of developing and maintaining the system would be borne by the Federal Center for Statistics. This would be true at all phases of development. In particular, the costs of necessary research and development at the national level would be borne entirely by the federal government, as would the costs of testing and verification.

As noted above, the state personnel requirements associated with a national education data system would depend almost entirely on a state's chosen level of participation in the system. And, to the extent that a state chose to integrate its data systems with the national data system, it would share in the cost of developing the national data system. Such cost sharing should be balanced with the relative benefits accruing to the parties involved.

Dollar outlay costs and personnel costs incurred by local education agencies would depend on the degree to which they chose to integrate their own data systems with the national system and, to some extent, on the degree to which their state chose to integrate its data systems with the national system. If neither the state agency nor the local agency chose to integrate their data systems with the national system, the dollar outlay and personnel costs incurred by a sampled local education agency would be negligible during the devleopment of the national system, and would not be substantial once the system became operational. In a state where the state agency chose to integrate its data systems with the national system, data for state management purposes would be collected from every school and local education agency in the state, and local education agencies would have to bear any consequent increased costs to meet the state's data needs. Efforts should be made to minimize--on a continuing basis such cost increases.

Development and phasing of the federal component

Phases of development. We propose that the federal component of the national data system be developed in distinct phases encompasing a five-year period. Phases would be distinguished by specified calendar periods. Within each phase, the specific categories and subcategories of data elements that compose the national data system would be at different levels of development. Data elements would differ in terms of their availability for operational use and the level of their aggregation. Some data elements would be objects of research and development; other data elements would have advanced to a field testing and verification stage; still other data elements would have been tested and verified in earlier phases, and would be available for operational use; a fourth category of data elements would not yet be available in any form. In addition, some data elements would be available initially only from aggregate records, while others would be available in the form of micro records. The phases would also be distinguished by the numbers and types of data elements that could be linked across data categories and data files, as micro records become available for operational use.

Categories of data. The categories and subcategories of data that will compose the national data system will be drawn directly from the conceptual model described in Chatper 4 and elaborated in an earlier section of this chapter. The major categories include: environment (community and family characteristics and expectations); incoming resources (financial revenues and other incoming resources for schooling); educative difficulties (pupils' capabilities, motivations, handicaps, English language facility, out-of-school supports, etc.); educative goals (school goals and objectives, curriculum); allocated resources (facilities, staff, equipment, materials, and other allocated and purchased resources); educational pursuits (curricular offerings, standards, teaching-and school-related activities); participation (pupil participation in the process of schooling); and outcomes (achievement, graduation or dropping out, political participation, employment).

Calendar periods. We propose that the first phase of development, following the establishment of the consortium described below, begin on July 1, 1986 and extend to December 31, 1986. The second phase of development would begin on January 1, 1987 and extend to June 30, 1987. Subsequent phases would encompass six-month periods thereafter, through June 30, 1991.

Status of data elements. In any phase, each data element that will ultimately be a part of the national data system can be characterized as belonging to one of three categories of development. At one extreme, would be data elements that are not yet included in any form. An intermediate category would be data elements that were collected only in aggregate form; e.g., school membership determined from a report prepared by a school. Note that we do not propose to develop such aggregate reports, only to maintain specific elements that are currently a part of critical NCES data-collection activities, until they could be replaced by tested and verified micro records. These micro records would constitute the third category (that is, the other extreme of development) of data elements. Currently, such micro records only exist in data projects such as NAEP or NELS.

Availability of data elements. We believe that most, if not all, of the data collection formats for elements required in early phases of implementation of the system already exist within current Center data programs (e.g., NAEP or NELS). Development of data collection formats and activities incorporating such data elements formats would be required to implement the system, but more fundamental "research" activities would not. At any phase of development, however, a data element that existed in micro record form might not yet be available for operation use. Initially, some micro record data elements would require extensive research and development. Once a data element has been newly devleoped, it would be subject to extensive field testing and verification; that is, a new data element in micro record form would not become a part of the operational data system until convincing evidence of its validity and utility has been amassed. Only after the validity, utility, and feasibility of collecting a data element in micro record form had been demonstrated, would that element be available as an operational part of the national data system.

Linkage among data files. As the different sets of data elements become available for operational use, linkages among these sets must be established, tested, and verified. The testing and verification also must include assessments of the relative utility of the relational policy analyses generated from the linked data sets. These assessments must continue and encompass the increasingly larger number of linked data sets that come on line as additional micro records become operational, until the national data system becomes fully operational.

Concurrent development activities. Although we will not elaborate here, implicit in the research, development, testing, and verification activities noted above are such data system design and development activities as the identification of essential populations of generalization; the design and selection of samples of data suppliers; the design of mechanics for collection of data, including specifications for, recruitment of, and training of data collectors; the design of survey field procedures; the design of plans for analysis of data and reporting of results; the development of systems for transmission of data; and the development of software systems for data receipt, control, editing, analysis, and summarization.

In the following table, we provide a truncated outline which is illustrative of the development and phasing activities discussed above. For example, under the category "Environment" we identify the subcategory "community and family characteristics" and indicate that, at the present time, data in this subcategory are collected only in aggregate form in the data collection activities currently being conducted by the Federal Center for Statistics. In Phase I, research and development activities would be undertaken, in Phase II, testing and verification would take place, and in Phase III, the data would become available in micro record form. The remainder of Table 1 can be read in the same fashion; in the subcategory "school goals" for example, research and development activities would not begin until Phase III, whereas in the subcategory "dropouts"--where data in aggregate form already are being collected--research and development activities would begin immediately in Phase 1. Note that Table 1 illustrates only the first three of ten proposed development phases.

Establishing priorities for development. Table 1 is only illustrative of the types of decisions that would have to be made in developing a national data system for elementary and secondary education. The actual choices of the order in which categories and subcategories of data elements would be developed must be made by the Federal Center for Statistics, the Office of Educational Research and Improvement, and the consortium of local, state, and federal agencies described below. However, based on our intensive and careful review of the needs expressed by authors of the papers underlying the Synthesis Report, we proposed consideration of the following priorities.

The conceptual model that is defined in Chapter 4 provides categories of data that are required to meet the information needs of education policy-makers at several levels of government, as well as those of the new constituencies for information identified in other parts of this report. Of all data categories defined by that model, school process information is least available now. School

Table 1. Illustrative Status of Categories and Subcategories of Data at Various Phases of Development of the National Data System

Categories & Subcategories	Current	Phase I	Status of Data Category Phase II	Phase III
Environment:				
Family and commun. characteristics	Ag.	Ag.(R&D)	Ag. (T.&V)	Micro.
Resources:				
Financial revenues	Ag.	Ag.	Ag. (R&D)	Ag.(T&V)
Educative Difficulties:				
Handicapped status	Ag.	Ag.(R&D)	Ag.(T&V)	Micro.
Motivation	Non.	Non.(R&D)	Non.(R&D)	Non.(T.&V)
Educative Goals:				
School goals	Non.	Non.	Non.	Non.(R&D)
Participation:				
Course enrollment	Micro.	Micro.(R&D)	Micro.(T&V)	Micro.(Rev.)
Outcomes:				
Dropouts	Ag	Ag.(R&D)	Ag.(T&V)	Micro.

LEGEND:

Non.	denotes a data subcategory that does not presently exist in the set of projects operated by the Federal Center for Statistics.
Ag.	denotes a data subcategory in which data are presently collected only in aggregate form in the set of projects operated by the Federal Center for Statistics.
Micro.	denotes a data subcategory in which data are presently collected in the form of micro records in the set of projects operated by the Federal Center for Statistics.
(R&D)	denotes a data subcategory in which research and development is to be conducted.
(T&V)	denotes a data subcategory in which testing and verfication is to be conducted.
(Rev.)	denotes a data subcategory in which the data previously existed in the form indicated, but for which revised data elements are developed and adopted.

process information includes; information on the educative goals of the schools; on allocated resources-- facilities, staff, equipment and materials; information on educational pursuits curricular offerings, standards, teaching-related and school-related activities; and information on pupil participation in the process of schooling. There is also a critical need for high quality outcome data. The best outcome data available are presently provided by NAEP. However, these data are limited to students at relatively few grade levels, are only collected biannually, and are limited in subject matter tested. Therefore, in our judgment, two categories of data -- school process data and outcome data -- deserve priority in the development of the national data system. However, although information on process and outcome have the highest priorities in terms of need, as a practical matter, the data system should attempt first to develop micro record on a small subset of data to develop the collection process and refine the data base development process. Information on pupil participation which would provide data for enrollment and attendance would be the priority candidate for initial development. The research effort to develop a more comprehensive set of process and outcome data should be given high priority and proceed on a parallel track.

School context information should constitute a third area of priority development; particularly information that describes the environment in which the schools operate, such as community and family characteristics and expectations, as well as information that describes the educative difficulties of students. In our judgement, these two categories of data should receive attention once the development of micro records is well underway in the school process and outcomes categories.

Our fourth order of priority would be to address data needs in the educative goals category. A final priority, but certainly essential, would be the categories of incoming and allocated resources, including revenues, and expenditures for, and stocks of, materials, equipment, facilities, and personnel. As is clear from Table 1, above, certain existing aggregates are recommended for phasing into micro record formats stages beyond Phase I. This raises the issue of parallel aggregate reporting for existing aggregate data series to allow users to move from the old problematic series to the micro record based series. This overlap should be carefully planned into the phasing of the new system.

Description and timing of the development and phasing of state involvement in the national data system. For the data system to be truly national, states must be involved in each phase of the development and maintenance of the system. One of the challenges to the Federal Center will be to ensure that this kind of state participation actually takes place.

The Department of Education has already begun to involve state governments in the process. Copies of the Synthesis of Invited Papers, which were commissioned to examine the needs for a new national data system for elementary and secondary education, have been sent to each of the governors, the leadership and education committees of the stage legislatures, the chief state school officers, and the various associations of state entities. Copies of an early draft of this document were also made available to staff members of some of the same associations for comment. Once the final decision is made to implement a new system, a formal federal/state mechanism must be established to plan and monitor the development of the national system.

A first step will be the establishment of a consortium to provide the planning mechanism. This consortium would be made up of representatives of the state governments as well as selected representatives of private school groups, persons from academia, representatives from the Department of Education and others interested in education. The consortium would be established through invitations sent by the department to each state. The governors, legislative leaders and the chief state school officers of each would be involved in the selection of a representative of that state to the consortium. At the same time the Department would nominate members who would be able to represent the views of other data providers and data users.

It is expected that the consortium will be appointed in the first quarter of 1986, and could have its organizing meeting in April. In preparation for the consortium's first meeting, the Center would prepare a draft agenda which would be circulated to the membership for comments.

The first major task of the consortium would be to select a committee to consider specific information requirements and recommend development and phasing priorities, with special attention to the standardization of data definitions for the system. This activity would be timed to coincide with and become part of the development and phasing effort described above. The Committee would consist of persons selected by the consortium as well as appropriate ex officio members of the staff of the Center for Statistics and other parts of the Department of Education. The committee as well as the consortium would be staffed by the Center.

There are several states which are now seriously considering the development of integrated management information systems. Another committee could be established, composed of the appropriate technical personnel from some or all of those states, to review the progress being made by each, and to attempt to develop common features which could then provide data to the Center under the provisions of Alternative B. Depending on the number of states involved, a limited number of "observer" states could participate in this effort.

The consortium would also consider other issues and establish such committees as are required to carry out its work, within the limits of the Center's ability to provide support.

It is expected that the full consortium would meet no more frequently than once a year. However, the committees would meet on an as needed basis and prepare reports which would be reviewed and approved by the membership and published as technical assistance for others.

REFERENCES

Adelson, Joseph, (1985) "Four Surprises, Or Why the Schools May Not Improve Much," in John H. Bunzel (Ed.), Challenge to American Schools: The Case for Standards and Values. New York: Oxford University Press.

Anrig, G. R. (1985, March 2) "Teacher Education and Teacher Testing: The Rush to Mandate." Paper presented at the Annual Meeting of the American Association of Colleges for Teacher Education, Denver, CO.

Banner, J. M., Jr. (1985) "Revising Educational Statistics." NCES Redesign Project.

Barro, S. M. (1985) "An Assessment of NCES Data Collection Efforts in Two Areas: School Finance and Teachers." NCES Redesign Project.

Benjamin, Robert, (1981) Making Schools Work: A Reporter's Journey Through Some of America's Most Remarkable Classrooms. New York: Continuum.

Berger, P.L., Neuhaus, R.J., (1977) To Empower People: The Role of Mediating Structures in Public Policy. Washington, D.C.: The American Enterprise Institute.

Berryman, S. E. (1985) "Education and Employment: Substitution Possibilities and the Teacher Labor Force: Supply and Demand." NCES Redesign Project.

Bishop, J. H. (1985) "Data Collection for Improving Elementary/Secondary Education." NCES Redesign Project.

Boyer, E. L. (1983) High School: A Report on Secondary Education in America. New York: Harper and Row.

Brundage, D., (1977) The Ford Fellows in Educational Journalism Report. Washington, D.C.: The Institute for Education Leadership.

California State Department of Education (1984) Data Acquisition Calendar.

Campbell, R.F., (1980) The Organization and Control of American Schools. Columbus, Ohio: Charles E. Merrill.

Coleman, J. & Karweit, N. (1972) Information Systems and Performance Measures in Schools. Englewood Cliffs, NJ: Educational Technology Publications.

Coleman, J., "Data Needs for School Policy in the Next Decade," an invited paper for the NCES Elementary/Secondary Redesign Project, June 1958.

Cooke, C., Ginsburg, A. & Smith, M. (1985) "Researchers Find that Education Statistics are in a Sorry State." Basic Education, 29, 3-8.

The Committee on Economic Development, (1985) Investing in Our Children: Business and the Public Schools. Washington, D.C.: The Committee.

Council of Chief State School Officers (1985) "Comments of the Council of Chief State School Officers on the National Center for Education Statistics Redesign of the Elementary and Secondary

Education Data Program." NCES Redesign Project.

Cronin, J. M. (1985) "Issues in National Educational Data Collection." NCES Redesign Project.

David, J. L. (1985) "Improving the Quality and Utility of NCES Data." NCES Redesign Project.

The Education Commission of the States, (1983) Action for Excellence: Report of the Task Force for Education on Economic Growth. Denver: The Commission.

Doyle, D.P., Levine, M., "Business and the Public Schools: Observations on the Policy Statement of the Committee for Economic Development," Phi Delta Kappan, October 1985.

Eubanks, E. E. (1985) "Data Needs for Big City Schools," NCES Redesign Project.

Fuhrman, S., Rosenthal, A., (1981) Shaping Education Policy in the States. Washington, D.C.: The Institute for Educational Leadership.

Goertz, M. E. & Pitcher, B. (1985) "The Impact of NTE Use by States on Teacher Selection." Princeton, NJ: Educational Testing Service.

Grant, W. V. (1985) "An Elementary and Secondary School Statistics Program for the National Center for Education Statistics." NCES Redesign Project.

Gwaltney, M.K. Balcomb, B.; (1981) Improving Our Understanding of the Relationship Between Educational Inputs and Processes, and Educational Outcomes and Life Chances, in Synthesis of Invited Papers: Elementary/Secondary Redesign Project: A Public Discussion Draft. Washington, D.C.: National Center for Education Statistics.

Hannaway, J. (1985) "Two Suggestions for NCES Data Collection." NCES Redesign Study.

Harrison, F. W. (1985) "Review of Elementary/Secondary School Data Needs of the National Center for Education Statistics." NCES Redesign Project.

Hawley, W. D. (1985) "Educational Statistics and School Improvement." NCES Redesign Project.

Hersh, R. H. (1985) "Organizational Efficacy as a Research Focus for School Improvement." NCES Redesign Project.

Hilliard, A. G., III. (1985) "Information for Excellence and Equity in Education," NCES Redesign Project.

Jaeger, R. M. & Tittle, C. K. (eds). (1980) Minimum Competency Achievement Testing. Berkeley, CA: McCutchan.

Kursch, H. (1965) The United States Office of Education: A Century of Service Philadelphia, PA: Chilton Books.

Lehnen, R. G. (1985) "Educational Statistics for Studies of Policy and Administration." NCES Redesign Project.

McClure, M. & Plank, D. N. (1985) "Educational Statistics for Educational Policy: A Political Economy Perspective." NCES Redesign Project.

McDonough, P. J., (1985) letter to Emerson J. Elliott.

Miller, I. (1985) "A House of Bricks." NCES Redesign Project.

Murnane, R. J. (1985) "Priorities for Federal Education Statistics." NCES Redesign Project.

Natriello, G. (1985) "Products and Processes of the National Center for Education Statistics: An Agenda for the Next Decade." NCES Redesign Project.

New York Stock Exchange, Office of Economic Research, (1982) People and Productivity: A Challenge to Corporate America. New York: The Exchange.

Odden, A. (1985) "Federal Collection of School Finance Data: New Needs for an Era of Education Reform." NCES Redesign Project.

Peterson, P. L. (1985) "The Elementary/Secondary Redesign Project: Assessing the Condition of Education in the Next Decade." NCES Redesign Project.

Pierce, N.R. (1977) "An 'Educational Bill of Rights?'" The Washington Post, December 13.

Plisko, V. W., Ginsburg, A. & Chaikind, S. (1985) "Assessing National Data on Education." NCES Redesign Project.

Reece, B. L., (1985) letter to Emerson J. Elliott.

Reisner, E. R. (1985) "New Areas for Educational Data Collection: What Students Are Taught and What They Learn." NCES Redesign Project.

Rosenholtz, S. J. (1985) "Needed Resolves for Educational Research." NCES Redesign Project.

Pipho, C. (1984) "State Competency Testing Programs." Denver, CO: Education Commission of the States.

Sandefur, J. T. (1984) Competency Testing of Teachers: 1984 Report. Bowling Green, KY: Western Kentucky University.

Scott-Jones, D. (1985) "Assessing American Education: Shrinking Resources, Growing Demands." NCES Redesign Project.

Selden, R. W. (1985) "Educational Indicators: What We Need to Know that We Don't Know Now." NCES Redesign Project.

The Education Commission of the States (1983) Action for Excellence: Report of the Task Force for Education on Economic Growth. Denver, CO: The Commission.

The Illinois School Student Records Act (1979) P. A. 79-1108. Springfield, IL.

The National Commission on Excellence in Education (1983) A Nation a Risk: The Imperative for Educational Reform. Washington, D.C.: U. S. Government Printing Office.

The National Commission on the Reform of Secondary Education (1983), The Reform of

Secondary Education, New York: McGraw-Hill Book Company.

The Twentieth Century Fund (1983) Making the Grade: Report of the Twentieth Century Fund Task Force on Federal Elementary and Secondary Education Policy. New York: The Fund.

Thomas, G. E. (1985) "Issues and Considerations for a Ten-Year Program on Elementary and Secondary School Data Collection." NCES Redesign Project.

Valdivieso, R. (1985) "Hispanics and Education Data." NCES Redesign Project.

Walberg, H. J. (1985) "National Statistics for Improving Educational Productivity." NCES Redesign Project.

Walberg, H. J. (1985) "National Statistics for Improving Educational Productivity." NCES Redesign Project.